DRAFT
ENVIRONMENTAL IMPACT STATEMENT

SMALL INTERCONTINENTAL BALLISTIC MISSILE PROGRAM

MALMSTROM AIR FORCE BASE, MONTANA

UNITED STATES AIR FORCE
JUNE 1987

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COVER SHEET
DRAFT ENVIRONMENTAL IMPACT STATEMENT
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MALMSTROM AFB, MONTANA

a. Responsible Agency: U.S. Air Force

b. Proposed Action: Deployment of the Small Intercontinental Ballistic Missile (ICBM) at Malmstrom Air Force Base (AFB) in Montana.

c. Written comments and inquiries on this document should be received by 21 August 1987 and directed to: Director of Environmental Planning, AFRCE-BMS/DEV, Norton AFB, San Bernardino, California, 92409-6448.

d. Designation: Draft Environmental Impact Statement (DEIS).

e. Abstract: The Air Force proposes to deploy 200 Small ICBMs within the 341st Strategic Missile Wing at Malmstrom AFB, Montana beginning in 1992. The missiles would be carried and protected by special vehicles called Hard Mobile Launchers (HMLs). The HMLs would be deployed within expanded fenced areas that surround existing Minuteman launch facilities. Currently, 200 launch facilities, located throughout an 8,500-square-mile (sq mi) area in north-central Montana, are supported by Malmstrom AFB. Some HMLs would also be located at Malmstrom AFB for training, maintenance, and repair purposes. Land would be acquired adjacent to existing launch facilities to accommodate expansions, and adjacent to the base to accommodate new military family housing and a HML vehicle operations training area. Existing explosive safety restrictive easements surrounding launch facilities would be expanded. To facilitate transportation of HMLs to and from deployment sites, the road system (including bridges and culverts) used for the Minuteman program may be improved where necessary to enhance vehicle clearance and weight-bearing capability. A Proposed Action, three system alternatives, and the No Action Alternative are analyzed in this DEIS. The Proposed Action provides for the deployment of 200 HMLs in earth-covered igloos (arched shelters) at 100 launch facilities. The Proposed Action provides military family housing on land to be acquired adjacent to Malmstrom AFB. Two housing options are also analyzed under the Proposed Action: one would provide 50 percent of programmed military family housing, the other would provide no new onbase family housing. System Alternative 1 provides for the deployment of 200 HMLs at 100 launch facilities in pre-engineered buildings and assumes the minimum operations personnel requirement of all alternatives. Alternative 2 provides for the deployment of 250 HMLs at 125 launch facilities in a manner similar to the Proposed Action, and represents the maximum manpower requirement of all alternatives analyzed. Alternative 3 provides for deployment of 200 HMLs at 200 launch facilities in pre-engineered buildings. Potential environmental impacts associated with these actions are considered in the DEIS in the following environmental categories: socioeconomics, utilities, transportation, land use, visual resources, cultural and paleontological resources, biological resources and threatened and endangered species, water resources, geology and soils, air quality, noise. Safety considerations are also discussed. This site-specific DEIS follows the November 1986 publication of the Legislative Environmental Impact Statement for the Small ICBM program which compared regional-level impacts of three alternative basing modes and numerous alternative deployment locations.

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EXECUTIVE SUMMARY

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This draft Environmental Impact Statement (EIS) provides environmental documentation for the proposed deployment and peacetime operation of the Small Intercontinental Ballistic Missile (ICBM) at Malmstrom Air Force Base (AFB). The draft EIS supports siting decisions which include the selection of individual missile deployment locations. The analyses described in this document will be presented at public hearings in July 1987. To ensure that public comments are considered in the preparation of the final EIS, comments must be received by August 21, 1987.

PURPOSE AND NEED

In January 1983, President Reagan convened a bipartisan Commission on Strategic Forces (the Scowcroft Commission) to review the purpose, character, size, and composition of the strategic forces of the United States and make appropriate recommendations on ICBM modernization. The Commission's report was issued in April 1983. Its findings and recommendations were later accepted by the President and Congress. Among its recommendations was that the United States immediately initiate engineering design of ". . .a single warhead ICBM weighing about fifteen tons. . .(leading) . . . to the initiation of full-scale development in 1987 and an initial operating capability in the early 1990s. . . Hardened silos or shelters and hardened mobile launchers should be investigated now. . ." (Report of the U.S. Commission on Strategic Forces 1983). In the 1984 Department of Defense (DOD) Authorization Act, Congress authorized start-up of the Small ICBM program at a pace that would permit full-scale engineering development to begin in fiscal year 1987. Congress recommended that the program be pursued as a matter of the highest national priority, with an Initial Operational Capability (IOC) by the end of 1992.

ENVIRONMENTAL IMPACT ANALYSIS PROCESS

The 1986 DOD Authorization Act directed the Air Force to prepare environmental documentation for the Small ICBM using a tiered Environmental Impact Analysis Process (EIAP). Tiering, which involves moving from general to specific environmental analyses as a program evolves, provides the balance and perspective appropriate for each stage of decision-making and is recommended by the Council on Environmental Quality (CEQ) regulations. The Small ICBM Legislative Environmental Impact Statement (LEIS), the first tier of the EIAP, was published in November 1986 and was provided to the President, the Secretary of Defense, appropriate congressional committees, the U.S. Environmental Protection Agency (EPA), and other interested parties. It provided information to support three decisions concerning the Small ICBM: (1) the selection of basing mode(s), (2) the selection of the areas where the system can be deployed, and (3) the decision to enter full-scale development of the weapon system. On December 19, 1986, the President announced the decision to proceed with full-scale development of the Small ICBM, and that the Hard Mobile Launcher at Minuteman Facilities basing mode at Malmstrom AFB had been selected for IOC. This EIS analyzes the potential environmental impacts of proposed deployment and peacetime operation of the Small ICBM in Montana, and constitutes the final tier of the EIAP for Malmstrom AFB.

SYSTEM DESCRIPTION

The Small ICBM will be effective against hardened military targets and will be small and light enough to facilitate basing in a mobile mode. The Small ICBM will be a three-stage, solid propellant, single reentry vehicle missile that will be 53 feet long, 46 inches in diameter, and weigh approximately 37,000 pounds. For comparison, the Peacekeeper,

our most modern ICBM, is 71 feet long, 92 inches in diameter, and weighs 195,000 pounds.

The missiles will be carried and protected by special vehicles called Hard Mobile Launchers (HMLs) that are designed to enhance survivability. These HMLs will be about 105 feet long, 14 feet wide, and weigh approximately 230,000 pounds, including the weight of the missile. The HMLs will be capable of traveling on paved, gravel, and dirt roads, and will have off-road capability.

Summary of Proposed Action and Alternatives

A Proposed Action, three system alternatives, and the No Action Alternative are analyzed in this EIS. The Proposed Action provides for the deployment of 200 HMLs in earth-covered igloos (arched shelters) at 100 launch facilities in Montana. The Proposed Action provides for the construction of military family housing for about 90 percent of new Air Force families. New housing would be constructed on land to be acquired adjacent to Malmstrom AFB. Two additional housing options were also analyzed under the Proposed Action: one would provide half of programmed military family housing and the other would have no new onbase military family housing. System Alternative 1 provides for the deployment of 200 HMLs at 100 launch facilities in pre-engineered buildings and represents the minimum operations personnel requirement of all alternatives. Alternative 2 provides for the deployment of 250 HMLs at 125 launch facilities in a manner similar to the Proposed Action and represents the maximum manpower requirement of all alternatives analyzed. Alternative 3 provides for deployment of 200 HMLs at 200 launch facilities in pre-engineered buildings and has manpower requirements similar to the Proposed Action. Under the No Action Alternative, no Small ICBMs would be deployed at Malmstrom AFB.

The major facilities required for operation and support of the proposed system would be located at Malmstrom AFB and at Minuteman launch facilities (silos) associated with the 341st Strategic Missile Wing. The HMLs would be deployed within expanded fenced areas that surround existing launch facilities in north-central Montana. Currently, 200 launch facilities, located throughout an 8,500-square-mile deployment area, are supported by Malmstrom AFB in Montana. Some HMLs would also be located at Malmstrom AFB for training, maintenance, and repair purposes. To facilitate transportation of HMLs to and from launch facilities, the road system (including bridges and culverts) used for the Minuteman program would be improved where necessary to enhance vehicle clearance and weight-bearing capability. In addition, land would be acquired adjacent to launch facilities to accommodate expansions, and adjacent to the base to accommodate new military family housing and a HML vehicle operations training area. Existing explosive safety restrictive easements would be expanded.

Except for routine maintenance (approximately once a year), the HMLs would remain at the launch facilities in a dash-ready configuration. Under warning of an attack, dispersal of HMLs from the launch facilities could be ordered. The geographically diffused arrangement of the launch facilities would enable the rapid dispersal of the HMLs over a large area. For peacetime transportation to and from launch facilities, the HMLs would be configured to ensure that loading on each axle is below 18,000 pounds.

Proposed Action

Proposed construction activities would be concentrated in the following areas:

- Malmstrom AFB;
- The existing Minuteman launch facilities; and
- The existing Minuteman deployment area road network.

Malmstrom Air Force Base. Malmstrom AFB is a Strategic Air Command (SAC) base which operates 150 Minuteman II and 50 Minuteman III launch facilities. It is located in north-central Montana, 1.5 miles east of Great Falls (Figure S1). Malmstrom AFB currently serves as the command, training, and operational and maintenance center for the Wing and provides centralized facilities for missile component storage, assembly, and maintenance. By 1988, an estimated 5,000 military and civilian personnel will be employed at Malmstrom AFB, including personnel assigned to support 16 new KC-135R aircraft.

For the Proposed Action, approximately 3.2 million square feet (sq ft) of new floor space would be constructed over a period of 6 years at the base to support Small ICBM operations, and some existing floor space would require additions and/or modifications to provide an additional 67,000 sq ft. Various roads, utilities, and other support construction would also be required. In addition, approximately 150,000 sq ft of floor space will be added between 1987 and 1989 to support the new KC-135R air refueling mission.

The majority of the technical facilities (Figure S2) would be constructed between 1990 and 1992 on the southeast side of the Malmstrom AFB runway, within or adjacent to the existing Minuteman Weapons Storage Area (WSA). The WSA would be expanded to accommodate Small ICBM weapon assembly and storage facilities. The HML vehicle operations training area would occupy about 600 acres to be constructed outside of the explosive safety zones generated by the expanded WSA, requiring an expansion of the base.

Personnel support facilities would be sited on the northwest side of the airfield and be integrated within the existing support complex, with the exception of military family housing. In total, 1,746 military family housing units are planned, which would require acquisition of additional land next to and north of the existing family housing area. Construction of personnel support facilities planned for the base would start in 1991 and be complete by 1995.

Base road improvements include widening Goddard Avenue from the main gate to the perimeter road near the central heat plant, modifying connections from the personnel support area to the perimeter road leading to the WSA, and improving the roads on the east side of the base from the WSA to their connection with U.S. Highway 87 east of Great Falls. Local streets connecting Great Falls with the main gate on Goddard Avenue may require improvements and the county road leading to the north gate may require relocation to make room for the additional military family housing.

Minuteman Launch Facilities. Minuteman launch facilities are unmanned missile sites which are generally situated in sparsely populated rural areas. Each launch facility is inside a fenced area occupying from 1 to 3.3 acres. Within this area are the silo, a service area, and various technical support facilities. Ten unmanned Minuteman launch facilities make up a missile flight. Each flight receives primary support and control from

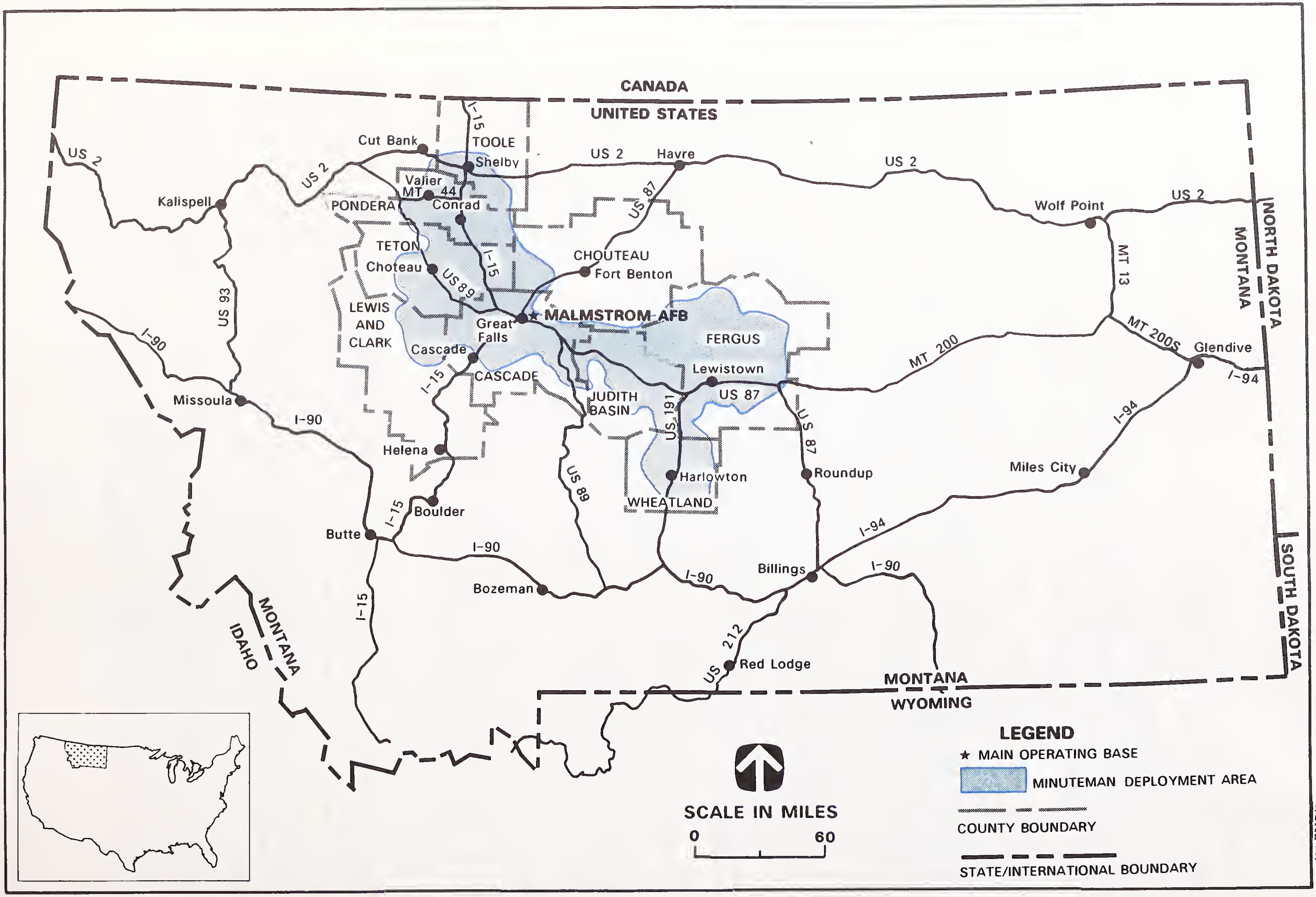


FIGURE S1 LOCATION OF MALMSTROM AFB AND MINUTEMAN DEPLOYMENT AREA IN MONTANA

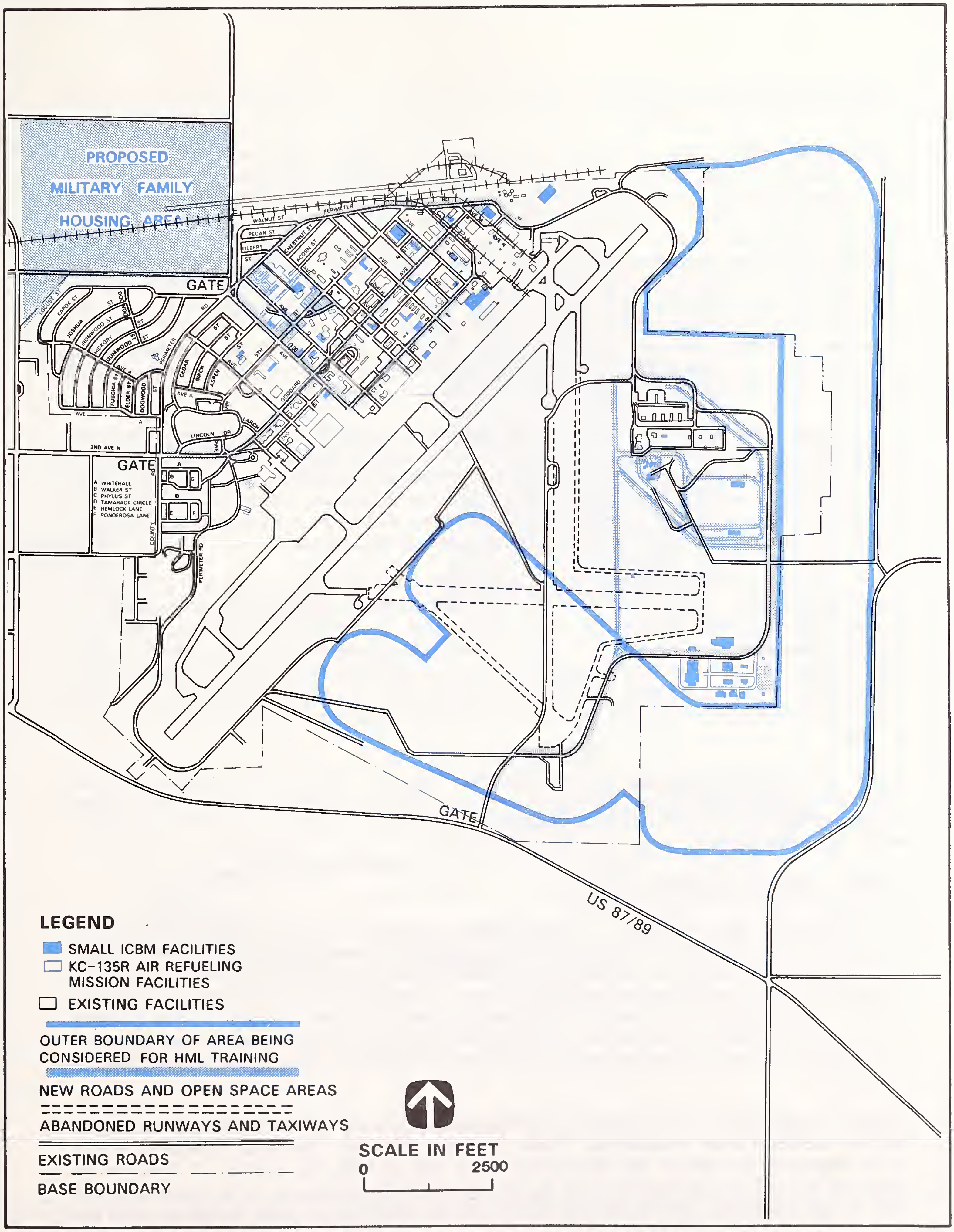


FIGURE S2 PROPOSED SMALL ICBM FACILITIES AT MALMSTROM AFB, MONTANA

a manned launch control facility. The 341st Strategic Missile Wing at Malmstrom AFB consists of 20 missile flights.

Small ICBM construction activities at existing Minuteman launch facilities in Montana would begin in the spring of 1991 and be completed in 1996. Each launch facility would be enlarged and the existing security fence would be relocated and extended to enclose this area (Figure S3). Launch facility expansion would vary with location, typically ranging from 1 to 2.5 acres. Two earth-covered igloos would be constructed near the existing Minuteman launch facility. A concrete masonry unit crew quarters would be constructed near the earth-covered igloos. Packaged crew life-support systems including air conditioning, water, and sanitation would be added. Existing explosive safety easements that restrict construction within 1,200 feet of Minuteman silos closures would be expanded to include an area to a distance of 1,250 feet from the igloos. Residential or other occupied structures falling in the expanded safety zone would have to be acquired by the Air Force unless the requirement is waived at the owner's request.

Deployment Area Roads. A system of designated roads in the deployment area is presently used to transport missile components to launch facilities using a transporter erector-emplacer vehicle (Figure S4). These designated transporter/erector (T/E) routes are also used by roving security patrols and missile maintenance teams. Of the 707 miles of deployment area roads in the T/E route network, 609 miles are state owned, another 1,090 miles are county roads, and there are 8 miles of city streets.

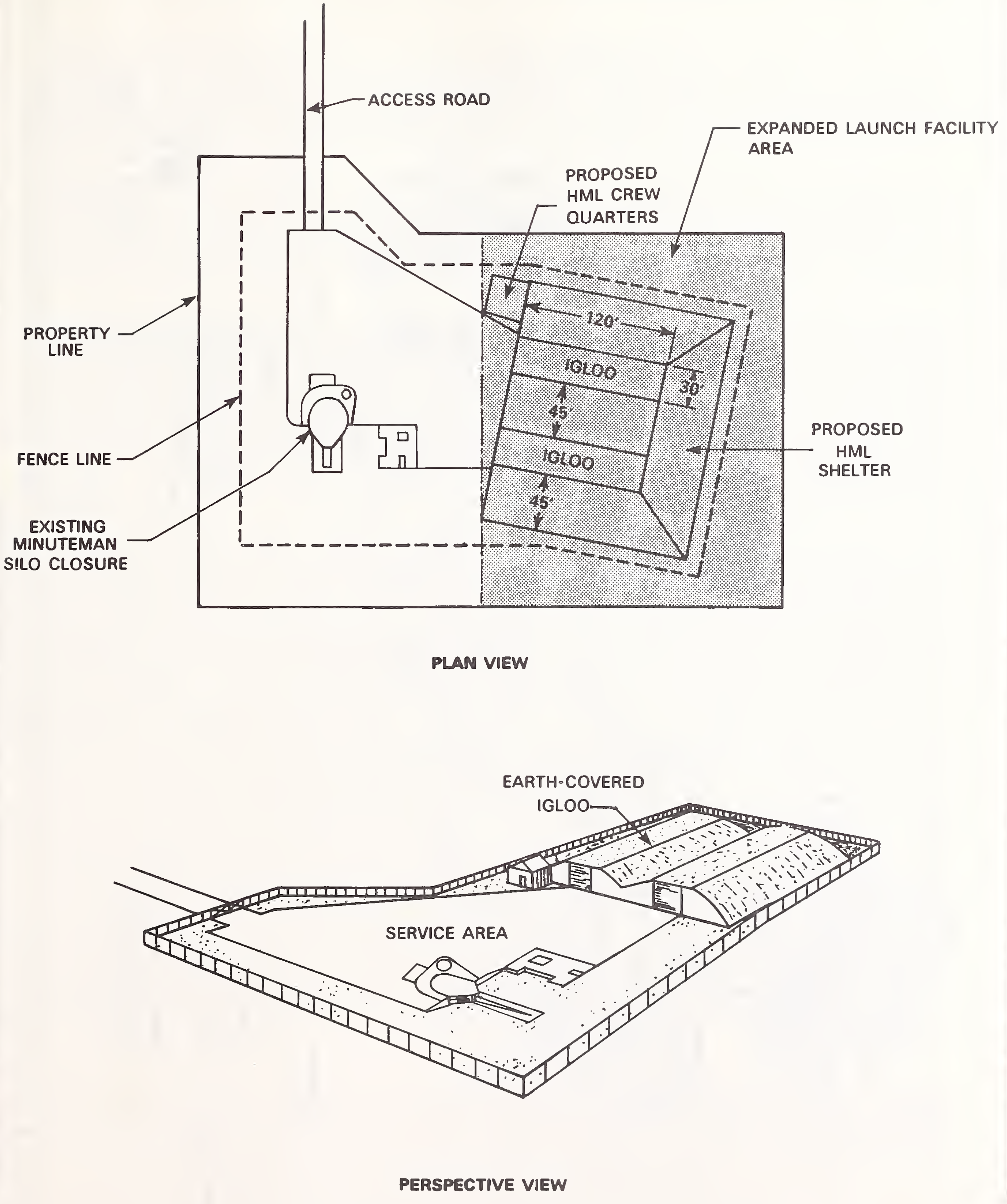
Public road improvements within the deployment area to support Small ICBM traffic would be limited to the T/E routes. Prior to construction, a formal process involving the Federal Highway Administration, state and local transportation agencies, Military Traffic Management Command, and the Air Force would determine specific road improvements, locations, and resources. In the interim, estimates have been made regarding anticipated changes required to accommodate the Small ICBM mission. Road improvements are scheduled to begin in the spring of 1990 and be complete by the fall of 1994.

There are 315 bridges throughout the T/E route network. Of these bridges, as many as 124 may require modification or replacement to support the HML. In addition to bridge improvements, about 310 culverts and 240 intersections throughout the T/E route network may be improved.

System Alternatives and Siting Options

In addition to the Proposed Action, system alternatives and siting options are considered. System alternatives involve major system considerations such as the number of missiles to be deployed. Siting options involve individual siting decisions within the Proposed Action, including selection of launch facilities and construction of housing units. As previously discussed, environmental documentation in support of the basing mode and area decisions for initial deployment of the Small ICBM system were provided in the LEIS. Therefore, basing mode or deployment area alternatives are not analyzed in this EIS.

System Alternatives. In developing the Proposed Action and its alternatives, a variety of system variables were considered. These variables included the total number of HMLs to be deployed throughout the Minuteman Wing (200 or 250), the number of HMLs to be deployed at each launch facility (1 or 2), the type of HML enclosures to be constructed at the launch facilities (earth-covered igloos or pre-engineered metal buildings), and the



EM1/5 EMS/4

FIGURE S3 LAUNCH FACILITY MODIFICATION CONCEPT FOR THE SMALL ICBM

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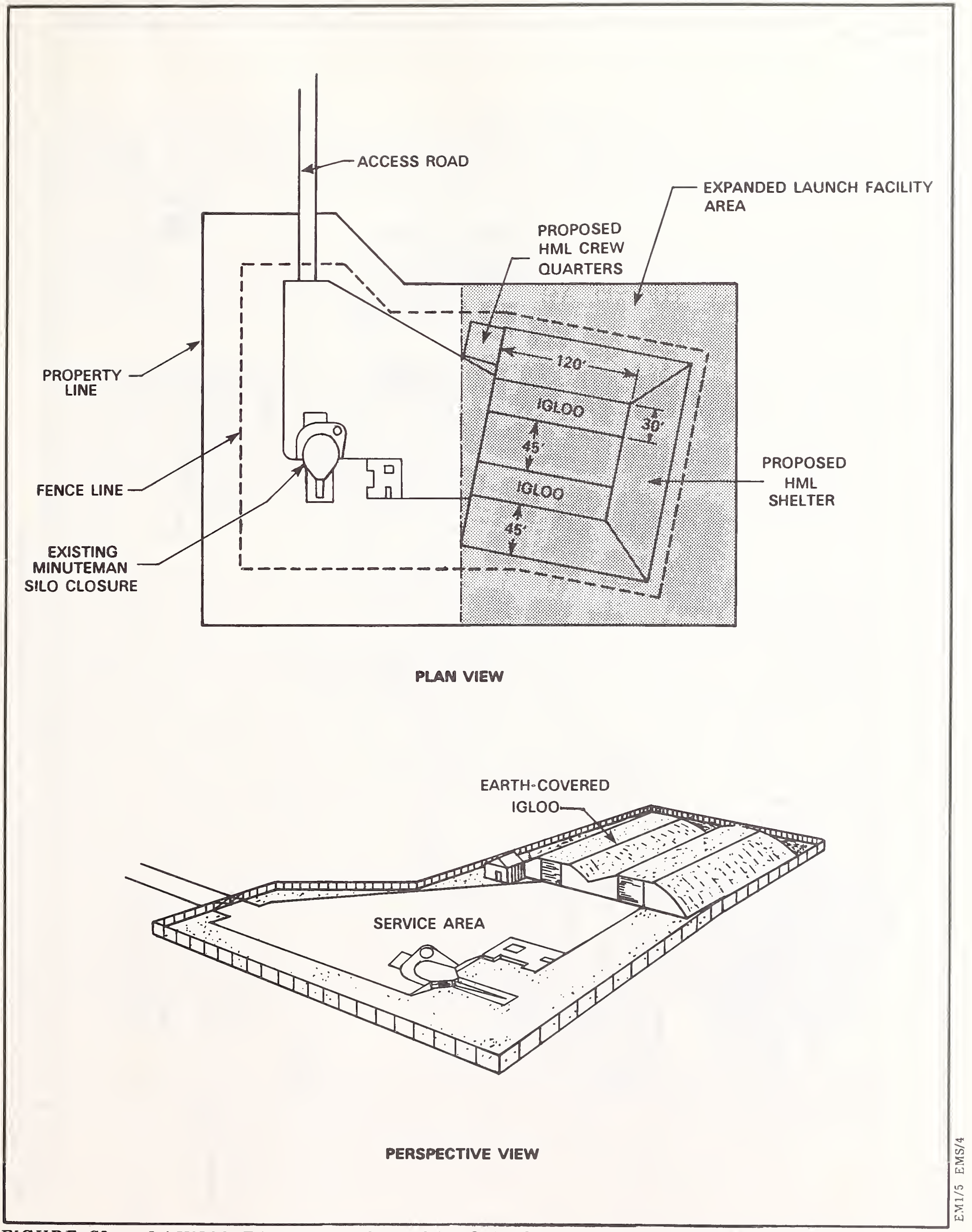
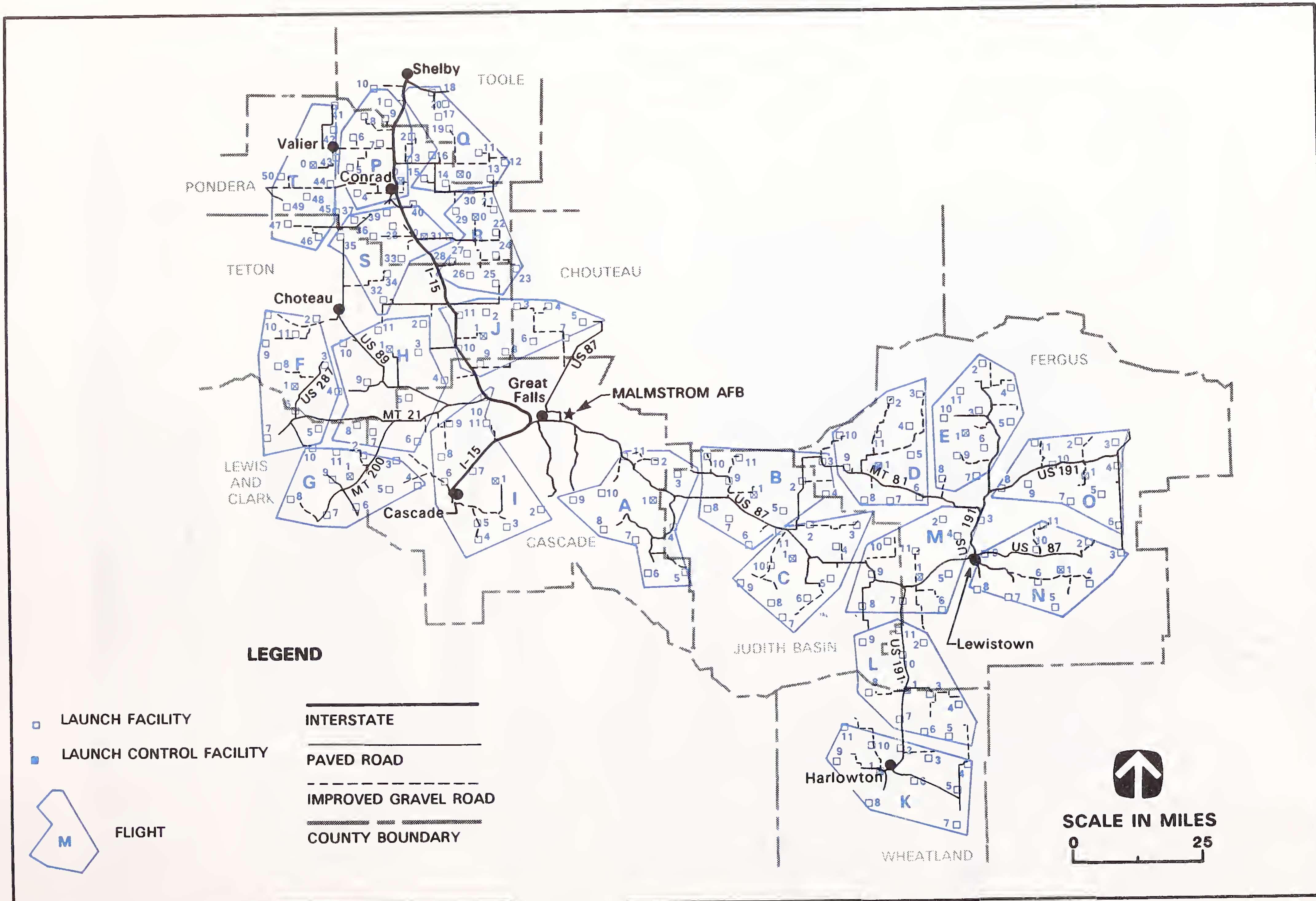


FIGURE S3 LAUNCH FACILITY MODIFICATION CONCEPT FOR THE SMALL ICBM



EM1/6 EMS/5

FIGURE S4 NETWORK OF PUBLIC ROADS USED BY TRANSPORTER ERECTOR-EMPLACER VEHICLES FOR ACCESS TO MALMSTROM AFB MINUTEMAN LAUNCH FACILITIES IN MONTANA

number of operations personnel required (which will depend on the number of personnel at each launch facility). Evaluation of combinations of these factors led to the selection of three system alternatives for analysis which, along with the Proposed Action, represent the range of anticipated environmental impacts (Table S1).

Siting Options. Siting options provide alternate locations where various Small ICBM facilities can be located. Two important siting decision categories will be supported by the analysis presented in this EIS: launch facility (including roads) selection and military family housing location. The environmental consequences of these options, as discussed in this EIS, will be considered in the final siting process.

Launch Facility Selection. All 200 launch facilities in the Malmstrom AFB Minuteman Wing are considered to be viable siting candidates for the Small ICBM program. Under the Proposed Action or Alternative 1, 100 launch facilities would be modified to accommodate HML enclosures. For Alternative 2, 125 launch facilities would be modified, and for Alternative 3, all 200 launch facilities would be modified to accommodate HML enclosures. Since all launch facilities are considered to be viable siting candidates, both existing conditions and site impacts of the new construction at each are discussed in this EIS. The overall impacts of modifications of 100, 125, and 200 launch facilities are also discussed.

Housing Options. The Proposed Action and Alternative 3 include a provision for 1,746 military family housing units to be constructed in an expanded area of Malmstrom AFB. These units would require the purchase of approximately 330 acres of land next to the existing family housing on the northwest corner of the base. For Alternative 1, an analysis of 1,230 onbase housing units was performed and for Alternative 2, 2,000 units were analyzed. The amount of military family housing constructed will ultimately be determined by a needs study, and may be limited by budget constraints. Therefore, two additional housing options were analyzed to evaluate the full range of possible consequences resulting from housing Small ICBM inmigrants within the City of Great Falls. For purposes of analysis, the housing options were evaluated in the context of the Proposed Action. Housing Option H1 assumes partial funding of military family housing and provides for construction of 873 units. Malmstrom AFB would be expanded in the same general area northwest of the base to accommodate these units. The remaining housing would be provided by the private sector in the Great Falls area. Housing Option H2 provides for no new family housing onbase, with all needed family housing to be provided by the private sector. The housing option selected would determine where many of the operations personnel would reside. This, in turn, would have an influence on the socioeconomic and other consequences of the program. Since Alternative 2 would have the greatest socioeconomic impacts, the consequences of selecting Alternative 2 without providing onbase military family housing are also discussed, where appropriate.

No Action Alternative

Under the No Action Alternative, the Small ICBM would not be deployed. The Air Force will maintain existing Minuteman ICBMs and the new KC-135R air refueling mission. The scope of such activities will not cause changes in currently projected future conditions in the area under consideration for basing of the Small ICBM.

OTHER AIR FORCE PROGRAMS AT MALMSTROM AIR FORCE BASE

An air refueling wing, consisting of 16 four-engine KC-135R aircraft, will be deployed at Malmstrom AFB prior to Small ICBM deployment. In addition, Malmstrom AFB is a

Table S1

Summary of Proposed Action and Alternatives
for the Small ICBM Program at Malmstrom AFB, Montana

	No. of Launch Facilities	No. of HMLs Deployed	HMLs per Launch Facility	HML Shelters	Explosive Safety Zone (feet from HML Shelter)	Peak-Year Construction Personnel (1990)	Operations Personnel	Family Housing Provided units (acres)
Proposed Action	100	200	2	Earth-Covered Igloos	1,250	1,080	2,190-3,100[1]	1,746 (330)
Proposed Action With Housing Option H1	100	200	2	Earth-Covered Igloos	1,250	1,080	2,190-3,100[1]	873 (165)
Proposed Action With Housing Option H2	100	200	2	Earth-Covered Igloos	1,250	1,080	2,190-3,100[1]	0 (0)
Alternative 1	100	200	2	Pre-engineered Buildings	1,795	1,080	2,190[1]-3,100	1,230 (232)
Alternative 2	125	250	2	Earth-Covered Igloos	1,250	1,120	2,620-3,760[1]	2,000 (380)
Alternative 3	200	200	1	Pre-engineered Buildings	1,425	1,160	3,100	1,746 (330)
No Action Alternative	0	0	0	-	-	0	0	0 (0)

Note: [1]Selected for environmental analysis (will depend on the number of personnel stationed at each launch facility).

candidate garrison location for the Peacekeeper in the Rail Garrison basing mode. (A garrison is a permanent, secure military facility where railroad trains carrying Peacekeeper missiles would be housed during peacetime operation.)

The KC-135R Air Refueling Mission

The Air Force will deploy a KC-135R air refueling wing at Malmstrom AFB in the last quarter of 1988. Sixteen KC-135R aircraft will be located on existing aircraft parking space and will use renovated and newly constructed aircraft operation and maintenance facilities at Malmstrom AFB. An environmental assessment of the KC-135R air refueling program was prepared by the Air Force; therefore, the impacts of the program are not separately presented in this EIS. However, the facilities and manpower requirements were considered in the evaluation of future baseline conditions for the Small ICBM at Malmstrom AFB. For example, the housing analysis includes a consideration of how much of the currently available housing in Great Falls would be used by KC-135R personnel. Therefore, environmental impacts are evaluated as cumulative effects of the Small ICBM and the KC-135R programs and all other missions currently assigned to Malmstrom AFB.

Peacekeeper in Rail Garrison

Malmstrom AFB is one of ten Air Force bases being considered as deployment locations (in addition to the main operating base at F.E. Warren AFB, Wyoming) for the Peacekeeper in Rail Garrison basing mode. If Malmstrom AFB is selected as a rail garrison location, four train enclosures would be constructed within a fenced area occupying 125 acres in the southeast area of the base. Personnel support facilities and other technical facilities would occupy about 285,000 sq ft of floorspace elsewhere on the base. Under normal peacetime conditions, the Peacekeeper missiles would be maintained in a continuous strategic alert status within the garrison enclosures. A separate EIS will be prepared for the entire Peacekeeper in Rail Garrison program. For the purposes of the present analysis, the cumulative environmental consequences of the Small ICBM and Peacekeeper programs at Malmstrom AFB are discussed.

PROGRAM RESOURCE REQUIREMENTS

Water, as well as aggregate, would be required from sources within the deployment area. Other construction materials such as cement, asphalt, lumber, and steel may be obtained from sources within the deployment area or elsewhere. Program water requirements are presented in Table S2.

Approximate areas of disturbance associated with Small ICBM construction are identified in Table S3 for Malmstrom AFB. The area disturbed by Alternative 1 would be slightly less than the Proposed Action; the areas disturbed by Alternatives 2 and 3 would be slightly greater than the Proposed Action. If Housing Option H1 is selected, the total surface disturbance at Malmstrom AFB for the Proposed Action would be reduced by 165 acres. If Housing Option H2 is selected, the total disturbance caused by the Proposed Action would be reduced by 330 acres. Surfaces that would be covered by impervious materials or kept in a cleared condition to accommodate buildings, parking lots, roads, training areas, and security zones are considered permanently disturbed.

Surfaces disturbed during construction, but later regraded or revegetated, or those able to return to a natural state during the operations phase of the program, are considered to be temporarily disturbed.

Table S2

Project-Related Water Use for the Small ICBM at Malmstrom AFB

	Construction Phase (acre-ft)			Operations Phase (acre-ft/year)
	Direct Construction Water	Indirect Water Use by Immigrants	Total	
Proposed Action	430	4,410	4,840	1,460
Housing Option H1	430	4,440	4,870	1,490
Housing Option H2	430	4,570	5,000	1,530
Alternative 1	360	3,630	3,990	1,040
Alternative 2	450	4,550	5,000	1,780
Alternative 3	360	4,400	4,760	1,460
Cumulative Small ICBM and Peacekeeper in Rail Garrison	450	4,910	5,360	1,600

Table S3

Approximate Acres Disturbed by Small ICBM Proposed Action Facility Construction in Montana

Alternative	Temporary	Permanent	Total
Proposed Action			
Malmstrom AFB	321	839	1,160
Launch Facilities	140	160	300
Deployment Area Roads	880	228	1,108
TOTAL:	1,341	1,227	2,568

PUBLIC SCOPING PROCESS

Scoping activities were undertaken in response to federal requirements as part of the assessment of environmental impacts. The scoping process involved a series of activities that included:

- A prescoping effort to collect preliminary data and information from federal, state, and local government organizations in the affected area;

- A series of scoping meetings with the public and governmental organizations in the affected area; and

- Analysis and documentation of scoping results.

Public scoping meetings were conducted in Great Falls, Lewistown, Miles City and Helena, Montana in March and April of 1987.

ENVIRONMENTAL CONSEQUENCES

The environmental consequences of the proposed Small ICBM program at Malmstrom AFB have been evaluated in terms of the magnitude and significance of the impacts. Magnitude is a measure of the numbers and kinds of environmental consequences of the program as compared to existing and future baseline conditions. It is defined by the level of impact (LOI), which can be negligible, low, moderate, or high. Significance requires consideration of both the context and the intensity of impacts. Context includes consideration of whether the setting of an impact is site, local, or regional and whether it is of short or long duration. Intensity refers to the severity of an impact, which includes consideration of its magnitude.

For the proposed Small ICBM program at Malmstrom AFB, site impacts would occur as a result of construction disturbance at the base (including the base expansions for family housing and the HML vehicle operations training area), at launch facilities, and along the T/E route network. Local impacts would occur in the City of Great Falls and other communities where program inmigrants would reside. Regional impacts would occur in basins or airsheds, or county or multiple-county areas from which construction resources would be extracted. The collective effects of site impacts would vary with the launch facilities selected, whereas the collective effects of local and regional impacts generally would not.

The LOI and significance of short- and long-duration effects were evaluated separately. Short-duration impacts are transitory effects of the proposed program that are generally caused by construction activities or operation start-up. Long-duration impacts would occur over an extended period or time, whether they start during the construction or operations phases. Most impacts from the operations phase are expected to be of long duration since program operations essentially represent a "steady-state" condition (i.e., impacts result from actions that occur repeatedly over a long period of time). However, long-duration impacts can also be caused by construction activities if a resource is destroyed or irreparably damaged, or if the recovery rate of the resource is low.

Figure S5 presents a summary of the collective LOI and significance of local and regional impacts for the Small ICBM program. Both short- and long-duration impacts for the Proposed Action and its alternatives are shown. Figure S6 provides a summary of the LOI and significance of site impacts at launch facilities. The assessments of site impacts

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible	☐	
Low	∘	•
Moderate	○	●
High	◯	⬤
Beneficial Effects	▒	

Note: Some resource elements may have both beneficial effects and adverse impacts.

PROGRAM IMPACTS	SHORT DURATION						LONG DURATION					
	PROPOSED ACTION						PROPOSED ACTION					
	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
SOCIOECONOMICS												
ECONOMIC BASE	○ ▒	○ ▒	○ ▒	○ ▒	○ ▒	○ ▒	○ ▒	○ ▒	○ ▒	○ ▒	○ ▒	○ ▒
DEMOGRAPHICS							●	●	●	●	⬤	●
HOUSING	▒	▒	▒	▒	▒	▒	○ ▒	⬤ ▒	⬤ ▒	○ ▒	○ ▒	○ ▒
EDUCATION							⬤	⬤	⬤	⬤	⬤	⬤
PUBLIC SERVICES (SEE NOTE BELOW)	○	○	○	○	○	○	●	●	●	•	⬤	●
PUBLIC FINANCE							●	●	● ▒	●	●	●
UTILITIES												
POTABLE WATER							∘	∘	∘	∘	∘	∘
WASTEWATER							∘	∘	∘	∘	∘	∘
SOLID WASTE							∘	∘	∘	∘	∘	∘
ENERGY	∘	∘	∘	∘	∘	∘	∘ ▒	∘ ▒	∘ ▒	∘ ▒	∘ ▒	∘ ▒
TRANSPORTATION												
ROADS	⬤	⬤	⬤	⬤	⬤	⬤	∘ ▒	⬤ ▒	⬤ ▒	∘ ▒	● ▒	∘ ▒
PUBLIC TRANSPORTATION												
RAILROADS												
AIRPORTS												
LAND USE												
URBAN							∘	∘	○	∘	∘	∘
RECREATION												
REGIONAL							∘	∘	∘	∘	∘	∘
LOCAL							●	●	●	●	●	●
WATER RESOURCES												
WATER USE	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘
SURFACE WATER	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘
GROUNDWATER	∘	∘	∘	∘	∘	∘						
GEOLOGY AND SOILS												
AGGREGATE RESOURCES	⬤	⬤	⬤	⬤	⬤	⬤	○	○	○	○	○	○
AIR QUALITY	∘	∘	∘	∘	∘	∘						
NOISE	○	○	○	○	○	○						

EM2/1 EMS/6

Note: Except for existing overcrowded conditions in the Cascade County jail, public service impacts would not be significant.

FIGURE S5 OVERALL COLLECTIVE SUMMARY OF LOCAL AND REGIONAL IMPACTS ASSOCIATED WITH THE SMALL ICBM PROGRAM IN MONTANA

	NUMBER OF LAUNCH FACILITIES													
	SHORT DURATION							LONG DURATION						
	NOT SIGNIFICANT				SIGNIFICANT			NOT SIGNIFICANT				SIGNIFICANT		
	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH
LAND USE														
RURAL	48	139	13					41	127	12		17	1	2
VISUAL RESOURCES	179		21					179	20	1				
CULTURAL AND PALEONTOLOGICAL RESOURCES														
PREHISTORIC												61	101	38
HISTORIC AND ARCHITECTURAL								185				10	5	
NATIVE AMERICAN								186				11	2	1
PALEONTOLOGICAL								1	91			6	100	2
BIOLOGICAL RESOURCES AND THREATENED AND ENDANGERED SPECIES														
VEGETATION	106	57			37			106	80			14		
WILDLIFE	125	38	37					124	76					
AQUATIC HABITATS	150	32	4	1	10	1	2	182	13	2		3		
UNIQUE AND SENSITIVE HABITATS	200							200						
THREATENED AND ENDANGERED SPECIES	172	22			5		1	172	22			5		1
WATER RESOURCES														
SURFACE WATER SEDIMENTATION	155	39	3	3				200						
GEOLOGY AND SOILS														
GEOLOGIC HAZARDS	113	77	8	2				113	77	8	2			
ENERGY RESOURCES	200							138	62					
SOIL EROSION	76	81	10	33				200						

Note: All cultural and paleontological resource impacts are assumed to be long duration.

EM2/2 EMS/7

FIGURE S6 SUMMARY OF SITE IMPACTS ASSOCIATED WITH PROPOSED SMALL ICBM CONSTRUCTION AND OPERATIONS AT LAUNCH FACILITIES IN MONTANA

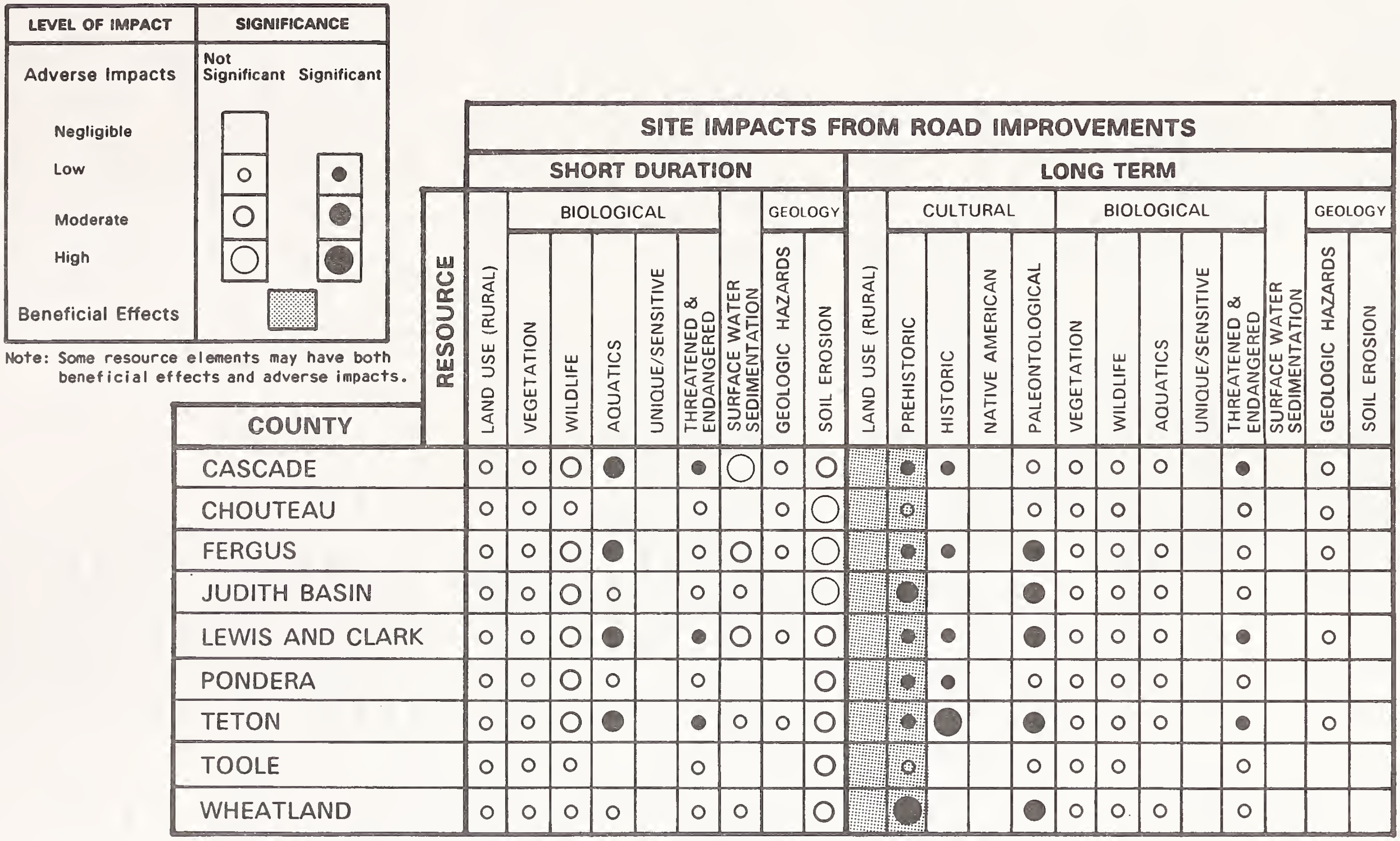
are based on the Proposed Action, which would locate two HMLs at each selected launch facility in earth-covered igloos. The conclusions are generally valid for all alternatives except for rural land use impacts. These impacts depend on the extent of the explosive safety zones which in turn depends on the type of HML shelter (igloo or pre-engineered building) and the number of HMLs (1 or 2) at each launch facility. Figure S7 provides a collective assessment of site impacts along road segments and bridges, compiled by county. These impacts would be the same for all alternatives since the same T/E route network would be used for all alternatives.

Impacts of the Proposed Action

Socioeconomics. In 1990, the peak-construction year, a total of 1,100 direct jobs and 1,250 secondary jobs would be created by the program with over 80 percent estimated to be filled by the local labor force. Regional unemployment rates from 1990 through 1992 are projected to decline about 1 percentage point because of this increase in job opportunities. The greatest total employment effect would occur in 1996 when 3,430 direct jobs and 1,350 secondary jobs would be required with about 30 percent filled by the local labor force. Program operations employment is projected to be 4,350 jobs (3,100 direct and 1,250 secondary) starting in 1999. Since the number of military dependents projected to be added to the labor force slightly exceeds the number of civilian jobs created by the program, long-duration unemployment rates for the region are expected to be about 0.2 percentage point above a projected baseline rate of 6 percent. The Proposed Action is expected to create $990 million in new spending for goods and services in the deployment area from 1990 through the year 2005. Spending by Air Force personnel and the Malmstrom AFB Contracting Office is expected to total $63 million per year throughout the life of the program. Overall economic base impacts of both short and long duration are considered to be moderate and not significant because of high construction industry requirements in 1990 and 1991 and a 0.2-percent increase in unemployment during the operations years. Beneficial effects for the state and the counties within the deployment area would occur as a result of increased employment and income during both construction and operations of the Small ICBM program.

Most of the population growth associated with the proposed program would occur in Cascade County, particularly in the Great Falls urban area. The number of new, program-related, full-time residents in Great Falls would start at about 770 in 1990, build to a peak of 8,120 in 1996, and stabilize at 7,580 by the year 2000. Two other communities, Lewistown and Conrad, are expected to experience gains in population of 100 persons or less during periods when deployment area construction is centered around Fergus and Pondera counties. During program operations, the population increase of 7,580 persons would be primarily composed of Air Force personnel and their dependents, raising the total of active-duty military workers and families in Great Falls from 10,700 to 18,210 persons. This military population in the year 2000 would represent 23.6 percent of Great Falls community population in that year. Military inmigrants would differ considerably from the current population in Great Falls in such demographic characteristics as age, marital status, geographic origin, income, and length of residency. Consequently, these long-duration impacts on demographics are considered moderate and significant since the differences between the local and inmigrating populations would complicate the process of community assimilation.

The effects of the Proposed Action on temporary and permanent housing would be predominantly beneficial since the program would lower the vacancy rates for existing units. During construction, both hotel-motel accommodations and permanent housing would be required by program workers. Business and property owners would benefit from increased occupancy and income.



Note: Some resource elements may have both beneficial effects and adverse impacts.

Note: All cultural and paleontological resource impacts are assumed to be long duration.

FIGURE S7 COLLECTIVE SUMMARY OF SITE IMPACTS ASSOCIATED WITH ROAD AND BRIDGE IMPROVEMENTS FOR THE SMALL ICBM PROGRAM IN MONTANA

The majority of Air Force operations personnel would live in new dormitories or family housing (1,746 units) built onbase. Since some military families as well as single personnel would be living offbase in the Great Falls community, there would be increased competition for suitable and affordable housing causing a moderate but not significant impact over the life of the program. Beneficial effects to property owners would also be of long duration.

Program-related enrollment in the Great Falls Public Schools (GFPS) system is projected to be 120 students in the 1990-91 school year, increasing to a peak of 1,300 students in 1996-97, and then declining to about 1,210 pupils during operations years. In the year 2000, program-related enrollments in the GFPS system would represent an increase of 9.1 percent above the projected baseline enrollment of 13,275 students. Other public and private schools are expected to have slight increases in enrollment. The GFPS system has a tradition of minimizing the busing of elementary school children (K-6) by having them attend neighborhood schools. The Proposed Action with 1,746 units of military family housing onbase would tend to concentrate school children of military personnel near the base. As a result, approximately 590 out of a projected 660 elementary pupils associated with the Small ICBM program would be within the boundaries of the Loy Elementary School, located just west of the base. This gain in enrollment would increase the pupil-to-teacher ratio in this school to over 50-to-1, far above both local and state standards. Consequently, impacts on education would be high and significant and would continue for the life of the program.

Construction activity in the deployment area is expected to result in increases in health and emergency services demand of about 9 percent in Cascade County and 5 percent in Fergus County during the early years of the program. Population inmigration would cause calls for service to the Great Falls Police Department and Cascade County Sheriff to increase by about 10 percent over baseline levels, requiring some increase in personnel. Most of the local facilities needed for public safety, fire protection, and health and human services have sufficient capacity to accommodate the additional population generated by the program. One exception is the Cascade County jail, which is utilized by both Cascade County and the City of Great Falls. This facility was built in 1914 and has been utilized beyond its design capacity for several years; it cannot be expected to absorb further growth. Consequently, impacts on public services would be moderate and significant and would continue for the life of the program.

Increases in population within Cascade County, the City of Great Falls, and the two Great Falls school districts would require these jurisdictions to increase expenditures in order to maintain existing service levels. Concurrently, program-induced population would generate additional revenues accruing to these jurisdictions. Under the Proposed Action with programmed housing onbase, all of these jurisdictions may experience continuous annual revenue shortfalls as a result of the program. The City of Great Falls, with a projected budget averaging $22 million during the 1990s, would sustain annual shortfalls ranging up to $100,000 over the build-up phase and continuing over the life of the program. Cascade County, with a projected budget averaging nearly $12 million during the 1990s, would have revenue shortfalls due to the program of $270,000, which would continue over the life of the program. The two GFPS districts, with a combined projected average budget of about $36 million during the 1990s, would experience program-related shortfalls ranging up to $570,000 in FY 1997, and then declining to a long-duration annual deficit of approximately $140,000. Other counties, cities, and school districts would be minimally affected. Overall public finance impacts of the Proposed Action are of long duration and considered to be moderate and significant and would continue over the life of the program.

Utilities. Potable water and wastewater treatment systems operated by the City of Great Falls provide service to Malmstrom AFB. These systems currently have adequate capacity to meet the increased Malmstrom AFB and city demands that are associated with the Proposed Action. Solid waste disposal service is provided to the Great Falls urban area by the city and Greens Disposal Company. The existing landfill sites have adequate capacity to dispose of the additional solid waste associated with the program. Energy utilities impacts during the construction phase are primarily associated with the increased use of diesel fuel for construction vehicles. During the operations phase, demands for all energy resources would increase, but would be met from existing or programmed supplies. Short- and long-duration impacts to all utilities are considered negligible or low and not significant since adequate capacity is available to meet the increased demands without any additional cost or deterioration in the level of service. Beneficial effects to natural gas are anticipated since Great Falls Gas Company would recoup lost sales as onbase natural gas use increases.

Transportation. Impacts to transportation would occur primarily from workers commuting on roads during the peak-traffic hours and from local delays experienced along some segments of the T/E route network associated with transportation of the HMLs to Malmstrom AFB for maintenance. Short-duration, significant impacts on roads in Great Falls are expected due to increased congestion and delay along the 15th Street bridge and U.S. 87 Bypass, increased queuing and delay at the entrance gates to Malmstrom AFB, and the further aggravation of service on roads already at degraded levels such as 10th Avenue South. Long-duration impacts on streets in the Great Falls area would be low and not significant. Long-duration, low, and not significant impacts are expected because of the queuing and delays that would be experienced on some sections of rural two-lane highways during the movement of HMLs to and from launch facilities. Program-related road and bridge improvements and increased road maintenance of T/E routes would provide greater safety and convenience for the road users and therefore represent a beneficial effect to the region. No significant adverse impacts are expected on public transportation, railroads, and airports.

Land Use. The overall impacts of the Proposed Action on rural land use could range from not significant to significant depending on which launch facilities are used for the Small ICBM program. No inhabited structures would be located within the new explosive safety restrictive easements at 180 of the 200 launch facilities. The use of 100 of these launch facilities would not result in significant impacts. The expanded safety easements at the remaining 20 out of the 200 launch facilities would contain a total of 44 inhabited structures. Residential or other occupied structures falling in the expanded safety zone would have to be acquired by the Air Force unless the requirement is waived at the owner's request. If these 20 launch facilities are chosen, the long-duration impacts would be significant. Other deployment area actions such as road and bridge improvements would not have significant impacts since the construction activities would occur within existing rights-of-way. The impacts on urban land use would not be significant since adequate developable land exists in Great Falls to accommodate base expansion and new housing requirements in the community.

Recreation. North-central Montana offers many outdoor recreation opportunities primarily associated with the forested mountain ranges and the many lakes, rivers, and streams in the region. Recreation use in the region would increase as a result of program-induced population growth. The increased use may contribute to the crowding of some recreation areas during holiday and seasonal weekends. However, recreation areas in the region would generally be able to absorb the increased use, and the long-

duration impacts are expected to be low and not significant. Most of the increased use is expected to occur in the Lewis and Clark National Forest.

Great Falls has a well developed park and recreation system which provides recreation facilities and programs for the city's residents. Program-induced population growth in Great Falls would increase the demand for recreation programs and facilities. The increased demand would result in or contribute to facility shortages within the local recreation system, particularly for softball and golf. Facility shortages may result in a noticeable decline in the level of service provided by the local system. Impacts are considered significant because the development of new facilities and parkland may require extensive institutional response in the form of capital expenditures. The existing recreation facilities and programs in Lewistown and Conrad are adequate to accommodate the program-induced demand for recreation services.

Visual Resources. The overall impact of the Proposed Action on visual resources would not be significant. Only 21 launch facilities are located near scenic and heavily traveled highways (minimum 1,000 average annual daily traffic). The earth-covered igloos at these sites will tend to blend with most of the form, line, color, and texture of the various features of the landscape of the north-central Montana deployment area. Other deployment area actions such as road and bridge improvements would likewise not have significant impacts. The onbase construction proposed for Malmstrom AFB would be greater than 4,000 feet from U.S. Highway 87/89, and with intervening topography, would have low visibility.

Cultural and Paleontological Resources. The proposed program is likely to have adverse effects on all cultural and paleontological resource elements, primarily as a result of construction-related ground disturbance. Impacts would be significant because of the potential for affecting sites having historic, scientific, or cultural importance. Overall impacts would be low for most resources because the number of sites likely to be affected is small relative to the regional resource base.

Prehistoric sites are most likely to exist where prominent landscape features (e.g., bluffs and buttes) coincide with water sources such as lakes, springs, and rivers. The most sensitive areas would be along major drainages where previous studies have recorded up to 2 sites per river mile. Therefore, sites are most likely to be affected by road and bridge construction at river crossings. One historic bridge, which is eligible for listing in the National Register of Historic Places, and six potentially eligible bridges would also be affected. Other effects on historic resources are limited mainly to the indirect effects of increased vandalism to vacant historic structures in the deployment area.

A variety of Native American groups have historic connections to the north-central Montana region, and some of these groups responded to a request for a statement of their concerns. Sacred areas can be affected by physical disturbance and audible and visual intrusions. No known or projected sacred sites are expected to be affected by ground disturbance, but some construction activities may cause intrusions on sensitive areas. Most Native American concern focuses on the possibility of accidentally encountering burials during construction. Such sites are of major sacred significance, and reburial, after consultation with the proper Native American group would be an appropriate method of treatment.

Internationally known paleontological resources occur in the Willow Creek Anticline area of the Two Medicine Formation found north and east of Great Falls, and in the Bear Gulch Limestone found east of Lewistown. Fossils similar to those reported from these

two localities occur elsewhere in the study area but the materials appear to be less concentrated, less well preserved, and therefore, less important. Impacts to these fossil localities would constitute a loss of scientific research potential, but their limited areal extent suggests avoidance is possible.

Biological Resources and Threatened and Endangered Species. Construction of new facilities onbase (including expansion to lands adjacent to the existing base boundaries) and use of the HML vehicle operations training area would not have a significant impact on native vegetation, wildlife, aquatic habitats, or unique and sensitive habitats. Most of the undeveloped portion of Malmstrom AFB has been seeded with grasses and the developed portion has been planted with various trees and shrubs; the area surrounding the base consists of agricultural lands. Several small wetlands onbase may be eliminated, but these wetlands are not important habitats.

Overall impacts to vegetation, wildlife, aquatic habitats, and unique and sensitive habitats in the deployment area are not expected to be significant. Approximately 45 percent of the area along T/E routes in the deployment area supports native vegetation and most of the remaining area is under agricultural development. Sensitive vegetation types that may be disturbed include small areas of forest, riparian habitat, and native grassland. Some temporary disturbance of wildlife is probable at 76 launch facilities that occur in sensitive wildlife habitat (e.g., big game wintering habitat). These impacts are expected to be minor because only small, localized areas would be affected. Overall species populations and the affected individuals should recover quickly from the disturbance and return to the area at densities close to predisturbance levels. Construction at launch facilities and along T/E routes (especially at bridge upgrades) may have some short-duration impacts on fisheries and wetlands. Long-duration impacts to rivers, streams, and lakes are expected to be very low. No unique and sensitive habitats should be directly disturbed by this program.

Program-induced growth in Great Falls, Montana would cause increased hunting and fishing pressure in the area. The primary areas that would be affected are the Belt and Highwood mountains, the Benton Lake National Wildlife Refuge, and along the Missouri River. These population-related impacts to biological resources should not significantly affect the biota in the area because much of the wildlife can withstand the increased hunting and fishing. Furthermore, the hunting and fishing of sensitive wildlife is regulated by permit or management systems.

No threatened and endangered species occur on Malmstrom AFB and there is no suitable habitat onbase to support any of the sensitive species that are known to occur in the region. Five federally listed animal species (grizzly bear, gray wolf, bald eagle, peregrine falcon, and black-footed ferret) may occur in the program area. Although several launch facilities and potential road improvement sites occur in the general habitat of some of these species, actual disturbance levels and loss of habitat are expected to be minor. Eight federal-candidate and 5 Montana-recognized animal species also occur in the deployment area. Disturbances to these species are also expected to be minor. One federal-candidate plant species occurs in the deployment area, but it is unlikely that this species would be affected by this program. Eleven Montana-recognized plant species occur in the deployment area and may be affected by the program. Program-induced population growth should not lead to any loss of threatened and endangered species habitat or increased mortality in species populations. Therefore, the short- and long-duration impacts to threatened and endangered species are not expected to be significant.

Water Resources. The Proposed Action would have no significant impacts upon the water resources of the region. Most of the program-induced water demand (Table S2) would occur at the three urban areas most affected by the program: Great Falls, Lewistown, and Conrad. The water sources supplying all three are adequate to meet program needs. Considerably less water would be used in the rural portions of the deployment area for program construction and operations. Water use in all rural areas would not exceed 100 acre-feet per year. Therefore, the impact to surface or groundwater resources or to existing water users is expected to be low.

Temporary declines in water quality would occur along some streams due to bridge replacements and upgrades of portions of the T/E routes. These streams include the Dry Fork of the Belt Creek, the Ross Fork of the Judith River, Careless Creek in the Musselshell drainage, and to a lesser extent, several tributaries to the Sun, Teton, and Marias rivers. The declines in water quality would be of short duration only. Expansion of the launch facilities may contribute to long-duration saline-seep problems at some sites. Finally, local storm runoff from Malmstrom AFB would increase by up to 17 percent following construction of new facilities at the base. Development downstream from the base is minimal and no increase in flood damage is expected to result. None of these site-specific impacts are expected to be significant.

Geology and Soils. Aggregate requirements for construction are estimated at approximately 3 million tons regardless of the alternative selected. Regional aggregate resources are sufficient to satisfy program demand for road materials and concrete. However, the program demand for aggregate during the construction phase is not likely to be satisfied without local production shortages in the Shelby/Conrad and Lewistown supply areas. In addition, existing commercial reserves in all supply areas would be depleted as a result of program demand causing significant short-duration impacts. Long-duration impacts would not be significant because adequate supply and production capacity could be developed to respond to any foreseeable long-duration demand.

Impacts as a result of expansion of launch facilities and road and bridge improvements, as well as facility construction and operations at Malmstrom AFB, are expected to affect elements of the geology and soils resource. These effects are primarily of short duration, occurring during the construction phase, with few long-duration impacts. Significant site impacts are expected to soil resources at the proposed HML vehicle operations training area because of the appreciable amount of soil erosion as a result of HML training operations. A number of launch facilities have soils that are moderately to highly susceptible to mass movements and erosion. Several launch facilities additionally have active oil and gas leases and coal leases adjacent to them. Some short- and long-duration impacts are expected to mass movements (i.e., landslides), energy resources, and soil resources due to land acquisition and construction activities at launch facilities and road and bridge upgrade sites. Impacts would be dependent upon the launch facilities selected, and none are considered significant.

Air Quality. Increased fugitive dust during the construction phase would cause low but not significant short-duration impacts. Vehicle exhaust emissions, particularly carbon monoxide, associated with construction and operations activities of the Small ICBM either at Malmstrom AFB or within the deployment area are projected to have no significant impact on air quality. No degradation of regional visibility resulting from fugitive dust emissions was predicted at the nearest Prevention of Significant Deterioration Class I area (Gates of the Mountains Wilderness). It has been concluded that the overall long-duration air quality impacts of the Small ICBM program would be negligible and would not cause state or national ambient air quality standards to be exceeded.

Noise. Long-duration noise impacts due to vehicular traffic during the operations phase of the Small ICBM program would not be significant in either the Great Falls traffic corridors or in the deployment area. Temporary impacts from construction noise would occur within the immediate vicinity of the construction sites, mainly at Malmstrom AFB and at launch facilities. Anticipated construction noise at Malmstrom AFB is not considered significant; however, there are residences in close proximity to 45 launch facilities from which moderate construction noise impacts would cause a temporary annoyance.

Impacts of the Proposed Action With Housing Option H1

Housing Option H1 provides for the construction of 873 units of military family housing, one-half of the programmed 1,746 units. Certain socioeconomic impacts of the Proposed Action would be altered by this option. In addition, impacts associated with commuter traffic during the operations phase would be increased.

With Housing Option H1, more than half of the military families associated with the Small ICBM program would be required to find suitable housing in the Great Falls community. This increase in program-related demand would reduce projected available vacancies to zero by 1995, with the exception of housing units that are considered unsuitable. The current housing allowances for the projected officer and enlisted personnel mix average about $340 monthly per household. New private housing would require about $700 per month for units generally considered suitable. This would be out of the range of affordability for the Small ICBM military personnel below grade E-4, who receive an average housing allowance of only $265 per month. Since it is unlikely that the private market can provide new housing units that meet onbase standards at a price that military personnel can afford, housing impacts would be high and significant under this option. Although the overall conclusions for the other socioeconomic elements would not change under this option, some differences from the Proposed Action with programmed housing are noted. With respect to education, Housing Option H1 would disperse children of military personnel more widely throughout the GFPS districts. Although this would lessen the impact on Loy Elementary School near the base, the resulting pupil-to-teacher ratio would remain well above both local and state standards. An increase in the number of people living in the City of Great Falls rather than onbase would cause calls for service for public safety and other functions to rise. Such an increase in demand may require additional personnel in order to maintain existing service levels. Public finance impacts under this option are reduced for the City of Great Falls and Cascade County due to an increase in property tax revenues from offbase housing. The city's long-duration shortfall would decline from $100,000 to $14,000 and the county's would decrease from $270,000 to $180,000. This option would have the opposite effect on the Great Falls school districts since the loss of P.L. 81-874 funds paid to the districts for children living onbase may not be fully replaced by the gain in property tax revenue from offbase housing. Under this option, the combined annual program-related shortfall would increase.

Impacts on roads would increase as a result of trips generated by operations personnel residing offbase. Impacts during the construction phase would be essentially the same as for the Proposed Action. However, during the operations phase, about 800 more peak hour vehicle trips would be generated under this housing option than with the Proposed Action, causing long-duration, significant impacts. Increased congestion, queuing, and delay, and the further aggravation of service along roads already at degraded levels, are expected to occur. Some increased traffic noise and pollutant emissions would occur. However, the amount of increase is projected to be so small that the impacts to air quality and noise for this housing option are rated negligible. The long-duration beneficial effects of road and bridge improvements and the increased road maintenance along the T/E routes would remain. No significant adverse impacts are expected on public transportation, railroads, and airports.

Impacts of the Proposed Action With Housing Option H2

Housing Option H2 would provide no additional military family housing onbase. Certain socioeconomic impacts of the Proposed Action would be substantially changed by this option. Other impacts associated with commuter traffic would be further increased over Housing Option H1.

With no additional military family housing units on Malmstrom AFB, all Small ICBM operations personnel with families would be required to find suitable housing in the Great Falls community or elsewhere. This increase in program-related demand would reduce projected available vacancies to zero by 1992, with the exception of housing units that are considered unsuitable. Since it is unlikely that the private market can provide new housing units which meet onbase standards at a price that military households can afford, housing impacts would be high and significant under this option. Although the overall conclusions for the other socioeconomic elements would not change under this option, some differences from the Proposed Action with programmed housing are noted. For education, Housing Option H2 would disperse children of military personnel more widely throughout the GFPS districts. Although this would lessen the impact on Loy Elementary School near the base, the resulting pupil-to-teacher ratio for five other elementary schools would rise to about 30-to-1, which is above both local and state standards. An increase in the number of people living in the City of Great Falls rather than onbase would cause calls for service for public safety and other functions to rise. Such an increase may require additional personnel in order to maintain existing service levels. Public finance impacts under this option are reduced for the City of Great Falls and Cascade County due to an increase in property tax revenues from offbase housing. The city's fiscal impact would reverse from a $100,000 shortfall to a $38,000 surplus, and the county's annual program-related deficit would be reduced from $270,000 to $90,000. This option would have the opposite effect on the Great Falls school districts since the loss of P.L. 81-874 funds paid to the districts for children living onbase may not be fully replaced by the gain in property tax revenue from offbase housing. Under this option, the combined annual, program-related shortfall would increase.

Transportation impacts would further increase as a result of no additional military family housing units being constructed onbase. Impacts during the construction phase would be essentially the same as for the Proposed Action. During the operations phase, about 1,600 additional peak hour vehicle trips would be generated with this housing option than for the Proposed Action with programmed housing, resulting in long-duration, significant impacts. Further increases in congestion, queuing, delays, and deterioration of service levels would occur. Increases in traffic noise and pollutant emissions would be greater than for Housing Option H1. However, these increases would be small enough that the impacts to air quality and noise are rated negligible. The long-duration beneficial effects of road and bridge improvements and the increased road maintenance along the T/E routes would remain. No significant adverse impacts are expected on public transportation, railroads, and airports.

Impacts of Alternative 1

For Alternative 1, 200 HMLs would be deployed in pre-engineered buildings at 100 launch facilities. The potential range of site impacts associated with direct disturbance from launch facility modifications and road and bridge improvements would be similar to the Proposed Action. An exception to this would be rural land use impacts associated with expanded safety zones, which are larger for pre-engineered buildings than for earth-covered igloos. Impacts related to the inmigrating population would generally be lower

than for the Proposed Action since the number of operations personnel would be lower. Some differences in the impacts of this alternative as compared to the Proposed Action are discussed here.

The direct employment requirements of Alternative 1 would increase from 1,100 jobs in 1990 to 2,520 jobs in 1996, before leveling off at 2,200 in 1997. These requirements are about 900 personnel less than the Proposed Action during program operations. Total employment, income, and spending would be comparably reduced. Effects on the construction sector under this alternative would be smaller as would the potential increase in the unemployment rate due to the addition of military dependents to the labor force. Short- and long-duration economic base impacts would remain moderate and not significant and the beneficial effects of additional jobs and income would be enjoyed by the state and the counties in the deployment area. Total population change in the Great Falls area would peak at 5,890 in 1996 and then stabilize during program operations at 5,360 persons, 2,200 below the Proposed Action. Projected total military population is estimated to be 21.3 percent of the Great Falls community population; demographic impacts would remain moderate and significant because of the inmigration of a large number of people with different demographic characteristics. For housing, long-duration impacts are rated the same as for the Proposed Action with programmed housing (moderate but not significant). For education, long-duration impacts are rated the same as for the Proposed Action (high and significant), though school enrollments would be about 350 students lower. Public services impacts would be low primarily because of the lack of capacity in the Cascade County jail. Service demands would be somewhat reduced, but would remain significant. Public finance impacts in Cascade County, the City of Great Falls, and the two Great Falls school districts would remain moderate and significant because of persistent revenue shortfalls even though program-induced revenues and expenditures would be approximately one-third less than those estimated for the Proposed Action with programmed housing.

The overall impacts of Alternative 1 on rural land use could range from not significant to significant depending on which launch facilities are used for the Small ICBM program. With Alternative 1, the Air Force plans to use a pre-engineered building to shelter two HMLs at each of 100 launch facilities, which would result in a new safety easement of 1,795 feet from the shelters. There are no inhabited structures located in the new safety easements at 163 of the 200 launch facilities; the impact of using these 100 launch facilities would not be significant. The easements at the remaining 37 out of 200 launch facilities contain 82 inhabited structures. If these 37 launch facilities are chosen, the impacts would be significant. Deployment activity impacts on other rural and urban land uses are similar to those of the Proposed Action and would not be significant.

Impacts of Alternative 2

For Alternative 2, 250 HMLs would be deployed in earth-covered igloos at 125 launch facilities. The potential range of site impacts associated with launch facility modifications and road and bridge improvements would be similar to the Proposed Action, except that an additional 25 launch facilities would be modified. Expansion of safety zones at launch facilities selected would be the same as with the Proposed Action (1,250 feet from HML shelters). Impacts related to the inmigrating population would generally be somewhat higher than with the Proposed Action since the number of operations personnel would be higher. Important differences in the impacts of this alternative as compared to the Proposed Action are discussed here.

The direct employment requirements of Alternative 2 would increase from 1,140 jobs in 1990 to 4,010 jobs in 1997 before leveling off at 3,760 in 1997. These requirements are about 660 personnel larger than the Proposed Action during program operations. Total employment, income, and spending would be comparably increased. Effects on the construction sector under this alternative would be greater as would the potential increase in the unemployment rate due to the addition of military dependents to the labor force. Short- and long-duration economic base impacts would remain moderate and not significant and the beneficial effects of additional jobs and income would be enjoyed by the state and the counties included in the deployment area. Total population change in the Great Falls area would peak at 9,620 in 1997 and then stabilize during program operations at 9,200 persons, 1,620 above the Proposed Action. Projected total military population is estimated to be 25.1 percent of the Great Falls community population compared to a baseline proportion of 13.7 percent, and demographic impacts would become high and significant because of the large number of inmigrants with different demographic characteristics. With military family housing provided onbase, long-duration housing impacts are rated the same as for the Proposed Action with programmed housing (moderate but not significant). With no military family housing provided onbase, long-duration housing impacts would be high and significant. For education, long-duration impacts are rated the same as for the Proposed Action (high and significant), though school enrollments would increase by about 260 students. Public service impacts would become high because service demands would be somewhat greater and would remain significant due to the lack of capacity in the Cascade County jail. Public finance impacts in Cascade County, the City of Great Falls, and the two Great Falls school districts would remain moderate and significant because of persistent revenue shortfalls. For all jurisdictions, program-induced revenues and expenditures would be approximately 20 percent greater than those estimated for the Proposed Action.

Short-duration impacts on roads in Great Falls would remain significant because program-generated traffic would be between 5 to 9 percent greater than that of the Proposed Action. Program-related commuting during the construction phase is still expected to increase congestion, queuing, and delays on the 15th Street bridge, U.S. highway 87 Bypass, 10th Avenue South, and the entrance gates to Malmstrom AFB. With onbase family housing, Alternative 2 commuting by operations personnel would result in 430 peak-hour trips (compared to 265 for the Proposed Action with programmed housing), causing long-duration, moderate, and significant effects on the urban road system. If family housing is not provided onbase, Alternative 2 would result in 2,250 peak-hour commuter trips (compared to 1,855 for the Proposed Action with Housing Option H2), causing long-duration, high, and significant impacts. In either case, no significant adverse impacts are expected on public transportation, railroads, and airports.

Alternative 2 has the highest program water requirements; the construction and operations phase water use would be 3 and 22 percent more, respectively, than for the Proposed Action (Table S2). Nearly all of this increase in water use would be experienced in Great Falls. The city has an ample water supply to meet this demand and the impacts of Alternative 2 on water use would remain the same as that of the Proposed Action: short- and long-duration, low, and not significant. The overall impacts of this alternative on surface and groundwater hydrology and quality are also the same as discussed under the Proposed Action.

Impacts of Alternative 3

For Alternative 3, 200 HMLs would be deployed in pre-engineered buildings at all 200 launch facilities. The impacts related to population inmigration would be almost the

same as for the Proposed Action, since Alternative 3 has the same operations personnel requirements. Although twice as many launch facilities would be modified as compared to the Proposed Action, surface disturbance at individual launch facilities would be less. However, since all 200 launch facilities would be used, there is no possibility of avoiding launch facilities in sensitive areas. Important differences between the impacts of this alternative and those of the Proposed Action are discussed here.

The expanded safety easements for Alternative 3 would extend 1,425 feet from the HML shelters, and inhabited structures would be affected at 25 launch facilities. The other 175 launch facilities are in uninhabited areas. The impacts on rural land use would be significant. Impacts on urban areas would be the same as those described under the Proposed Action and would not be significant.

This alternative would have somewhat higher impacts on cultural and paleontological resources than would the Proposed Action. Nevertheless, impacts for prehistoric and historic resources, while significant, would remain low because relatively few sites would be affected, compared with the number of resources expected to occur in the area. These impacts are expected to be significant because it is likely that resources eligible for the National Register of Historic Places would be disturbed. Two known burial grounds and one Native American sacred area occur in the general vicinity of launch facilities which would be used under this alternative. Two launch facilities occur on geological formations expected to contain highly sensitive paleontological deposits; one is the Bear Gulch Limestone and the other is the Two Medicine Formation near the fossil deposit known as Egg Mountain in the extreme western portion of the deployment area. Impacts to Native American and paleontological resources are rated moderate and significant.

Because all launch facilities would be used for Alternative 3, it would be impossible to avoid sensitive habitats at some launch facilities. Increased impacts would occur for vegetation because of the use of launch facilities with forested and riparian vegetation. Sensitive wildlife habitat such as severe wintering habitat would be affected to a minor degree. Several of the launch facilities are adjacent to important fisheries streams and wetlands that would be disturbed under this alternative. Although the overall impacts to biological resources would be somewhat greater than for the Proposed Action, the total amount of disturbance would be small when compared to the resource base as a whole. Therefore, overall short- and long-duration impacts to vegetation, wildlife, aquatic habitats, and unique and sensitive habits would not be significant.

It would not be possible to avoid several sensitive habitats for threatened and endangered species under this alternative. Although disturbances at these sensitive sites are unlikely to jeopardize the existence of the species of concern, additional effort would be required to reduce disturbance to individuals and more mitigation measures may be required than with the Proposed Action. The overall disturbance to threatened and endangered species under Alternative 3 is expected to be somewhat higher than with the Proposed Action; however, the short- and long-duration impacts would not be significant.

Cumulative Impacts of the Peacekeeper in Rail Garrison and the Small ICBM Programs

The cumulative impacts of the potential Peacekeeper in Rail Garrison and Small ICBM programs would primarily occur to the Great Falls area. No additional site disturbance would occur at launch facilities or along the T/E routes. Additional surface disturbance would occur at Malmstrom AFB; however, no important cultural or biological resources are expected to be disturbed. The number of additional personnel associated with the

Rail Garrison program would be combined with the Small ICBM program and have some socioeconomic consequences in Great Falls.

Deploying the Peacekeeper in Rail Garrison at Malmstrom AFB would add another 700 people to the population of the Great Falls area. Cascade County employment and income benefits would be larger than for the Proposed Action alone. Construction-sector effects from 1991 through 1993 would be somewhat higher than under the Proposed Action alone, but still would be only moderate and not significant. Total jobs created by the Small ICBM and Peacekeeper in Rail Garrison programs combined would be 4,720 by the year 2000 (3,400 direct and 1,320 secondary). This is 370 jobs above the requirements for the Proposed Action alone.

For the potential Peacekeeper in Rail Garrison program, 160 new military family housing units are planned at Malmstrom AFB. It is not expected that new offbase housing construction would occur within the Great Falls urban area. An additional 30 military households are expected to live offbase, decreasing the support community's vacancy rate by 0.1 percentage point during the operations phase. The demand for onbase dormitory modules would increase by 50 units to accommodate about 110 Peacekeeper in Rail Garrison personnel. These facilities would be provided onbase. The demand for temporary offbase units is not expected to change, and there would be no additional impacts on housing in the Great Falls area.

This increase in population associated with Peacekeeper in Rail Garrison program, above the effects of the Proposed Action, would create the need for two additional government employees for both the City of Great Falls and Cascade County. No measurable effects are expected to be felt in the other areas of study. The number of projected long-duration enrollments in the Great Falls schools is expected to increase by 120 students, 66 of which are estimated to be elementary pupils. Program-induced revenues and expenditures of the city, county, and school districts would increase approximately 9 to 10 percent over levels estimated under the Proposed Action. Because of the small effect onbase development would have upon the tax base of the jurisdictions and the relatively small employment increases associated with the Rail Garrison program relative to the Proposed Action, a small increase in revenue shortfalls could occur.

No Action Alternative

Under the No Action Alternative, Air Force activities associated with maintenance of the current Minuteman force and other missions will continue indefinitely at Malmstrom AFB. These activities include the new KC-135R air refueling mission, which will be added in 1988.

Employment and population in north-central Montana are projected to increase gradually through the year 2000 without the Proposed Action or alternatives. Most of this growth will be concentrated in Great Falls and Helena, with little growth or modest declines expected in the rural counties. Unemployment rates should decrease to a regional average of 6 percent. The military population (active-duty personnel plus dependents) of the Great Falls area should be at about 10,500 persons, or 15.2 percent of total community population. Some anticipatory growth, followed by decline, is likely if individuals and businesses speculate on the likelihood that the program will be implemented.

Throughout the deployment area, population growth will lead to some increased disturbance of cultural resources and sensitive biological habitats. Water use may increase slightly in the region. Some increased crowding of recreational areas may occur, and the level of service along some roads is expected to decrease.

SAFETY CONSIDERATIONS

The Small ICBM system safety program extends from concept development, to system design, through deployment and operations. In the 25-year operating history of the Minuteman ICBM systems, the Air Force has never experienced a mishap leading to a fire or explosion. In addition, the technical advances to the components and operating procedures for the Small ICBM system ensure that the proposed system would operate safely.

Two extremely unlikely assumptions, that a mishap involving a HML occurs and that it results in the release of the total amount of available propellant and warhead materials, are the basis for the safety analysis. Given these unlikely assumptions, the predicted environmental impacts would be significant only within the immediate mishap vicinity for biology, human health and safety, water, and soils. Impacts on air quality would, however, be distributed farther, but such impacts would be of short duration.

MITIGATION MEASURES

Mitigation measures are undertaken to minimize the adverse environmental impacts of a given program. For the Small ICBM, efforts would be made to avoid environmentally sensitive areas and thereby eliminate or reduce program impacts. In addition, other mitigative programs may be employed to rehabilitate or restore the affected environment or to reduce or eliminate impacts through preservation procedures or compensation. Environmental impacts of the Small ICBM program may also be mitigated by commonly practiced construction methods. These assumed construction practices and other assumed mitigation measures are discussed for each resource in the EIS. The Air Force expects to implement these assumed mitigations. Additionally, potential mitigation measures to further reduce impacts and the agencies involved in their implementation are identified. Implementation of these potential mitigation measures may be constrained by budget limitations and mission requirements.

1.0

1.0 PROGRAM OVERVIEW

In the 1984 Department of Defense (DOD) Authorization Act, the Congress of the United States directed the Air Force to develop a new, Small Intercontinental Ballistic Missile (ICBM) in accordance with the recommendations of a bipartisan commission on strategic forces (Scowcroft Commission). The commission recommended that this missile be smaller and lighter than previous ICBMs, be compatible with both mobile and fixed basing modes, and meet modern performance and survivability goals. The total number of Small ICBMs to be deployed could range up to 1,000, with 500 missiles used for ongoing weapon system planning and budgeting. The Air Force proposes to deploy the first 200 missiles within the 341st Strategic Missile Wing at Malmstrom Air Force Base (AFB) in Montana beginning in 1992. This Environmental Impact Statement (EIS) describes the environmental impacts of the Proposed Action and its alternatives.

The major facilities required for operation and support of the proposed system would be located at Malmstrom AFB and at Minuteman launch facilities (silos) associated with the 341st Strategic Missile Wing. The missiles would be carried and protected by special vehicles called Hard Mobile Launchers (HMLs). The HMLs would be deployed within expanded fenced areas that surround launch facilities in north-central Montana. Currently, 200 launch facilities, located throughout an 8,500-square-mile deployment area, are supported by Malmstrom AFB. Some HMLs would also be located at Malmstrom AFB for training, maintenance, and repair purposes. To facilitate transportation of HMLs to and from launch facilities, the road system (including bridges and culverts) used for the Minuteman program may be improved where necessary to enhance vehicle clearance and weight-bearing capability. In addition, land would be acquired adjacent to existing launch facilities to accommodate expansions, and adjacent to the base to accommodate new military family housing and a HML vehicle operations training area. Existing explosive safety restrictive easements would be expanded.

A Proposed Action, three system alternatives, and the No Action Alternative are analyzed in this EIS. The Proposed Action provides for the deployment of 200 HMLs in earth-covered igloos (arched shelters) at 100 launch facilities in Montana. The Proposed Action provides military family housing on land to be acquired adjacent to Malmstrom AFB. Two housing options were also analyzed under the Proposed Action: one would provide 50 percent of programmed military family housing, the other would provide no onbase military family housing. System Alternative 1 provides for the deployment of 200 HMLs at 100 launch facilities in pre-engineered buildings and represents the minimum operations personnel requirement of all alternatives. Alternative 2 provides for the deployment of 250 HMLs at 125 launch facilities in a manner similar to the Proposed Action, and represents the maximum manpower requirement of all alternatives analyzed. Alternative 3 provides for deployment of 200 HMLs at 200 launch facilities in pre-engineered buildings and has manpower requirements that are similar to the Proposed Action. A summary of the Proposed Action and alternatives is provided in Section 1.3.6.

1.1 Environmental Impact Analysis Process

The 1986 DOD Authorization Act directed the Air Force to prepare environmental documentation for the Small ICBM using a tiered Environmental Impact Analysis Process (EIAP). Tiering, which involves moving from general to specific environmental analyses as a program evolves, provides the balance and perspective appropriate for each stage of decision-making and is recommended by the Council on Environmental Quality (CEQ) regulations. The Small ICBM Legislative Environmental Impact Statement (LEIS), the first tier of the EIAP, was published in November 1986 and was provided to the

President, the Secretary of Defense, appropriate congressional committees, the Environmental Protection Agency (EPA), and other interested parties. It provided information to support three decisions concerning the Small ICBM: (1) the selection of basing mode(s), (2) the selection of the areas where the system can be deployed, and (3) the decision to enter full-scale development of the weapon system. On December 19, 1986, the President announced the decision to proceed with full-scale development of the Small ICBM, and that the Hard Mobile Launcher at Minuteman Facilities basing mode at Malmstrom AFB had been selected for Initial Operational Capability (IOC). This EIS analyzes the potential environmental impacts of proposed deployment and peacetime operation of the Small ICBM in Montana, and constitutes the final tier of the EIAP for Malmstrom AFB. This document has been prepared to meet the requirements of the National Environmental Policy Act (NEPA) of 1969 and its implementing CEQ regulations. As other areas are selected for additional Small ICBM deployment, additional site-specific EISs will be prepared.

1.1.1 Structure of the Environmental Impact Statement

The environmental issues addressed in this EIS were identified through the public scoping process, through consultations with federal and state agencies, and by Air Force and contractor personnel who have experience with programs of similar scope. For discussion and analysis, the issues are grouped into 12 resource categories: socioeconomics, utilities, transportation, land use, recreation, visual resources, cultural and paleontological resources, biological resources and threatened and endangered species, water resources, geology and soils, air quality, and noise. The potential program-induced impacts are summarized and compared in Chapter 2.0 (Comparison of Alternatives). The current environmental conditions and projected future conditions without the program are described in Chapter 3.0 (Affected Environment) for each resource category. Detailed descriptions of environmental impacts are presented in Chapter 4.0 (Environmental Consequences). Chapter 5.0 (Safety Considerations) presents a discussion of system safety. Chapters 6.0 through 11.0 consist of the following supporting information: Authorizing Actions, List of Preparers, List of Recipients, Bibliography, Glossary of Terms and Acronyms, and Index. Appendix A provides a detailed listing of the existing environmental conditions at the launch facilities. Appendix B presents the programmatic agreements on data recovery for historic and cultural properties potentially affected by the Small ICBM program. Appendix C provides the concurrence of the U.S. Fish and Wildlife Service on the finding of no significant impact to threatened and endangered species.

1.2 Purpose and Need

American strategic forces exist to deter attacks on the United States and its allies and to prevent the coercion that could arise if the public or decision-makers believed that the United States could be attacked successfully. Such a policy of deterrence, like the security policy of the West itself, is essentially defensive and is based on a balance of mutually supportive forces. The strategic triad of the United States consists of submarine-launched ballistic missiles, bombers, and land-based ICBMs. In the past, the ICBM component of the triad relied upon Titan (now decommissioned) and Minuteman missiles. The increasing accuracy of Soviet missiles has placed the future of silo-based ICBMs at risk, while the hardening of the Soviet strategic targets has made the Soviet systems less vulnerable to the present arsenal of United States weapons. As missile technology has advanced, a need has developed for the United States to deploy newer, more accurate, and more survivable missiles to complement the existing forces. The Small ICBM is being deployed at Malmstrom AFB to partially meet this need.

In January 1983, President Reagan convened a bipartisan Commission on Strategic Forces (the Scowcroft Commission) to review the purpose, character, size, and composition of the strategic forces of the United States and make appropriate recommendations on ICBM modernization. The Commission's report was issued in April 1983 with its findings and recommendations accepted by the President and Congress. Among its recommendations was that the United States immediately initiate engineering design of ". . .a single warhead ICBM weighing about fifteen tons. . .(leading). . .to the initiation of full-scale development in 1987 and an initial operating capability in the early 1990s. . .Hardened silos or shelters and hardened mobile launchers should be investigated now. . ." (Report of the U.S. Commission on Strategic Forces 1983). In the 1984 DOD Authorization Act, Congress authorized start-up of the Small ICBM program at a pace that would permit full-scale engineering development to begin in fiscal year 1987. Congress recommended that the program be pursued as a matter of the highest national priority, with IOC by the end of 1992.

1.3 System Description and Location

This section describes the following aspects of the Small ICBM system: the missile and the HML, the operations concept, the Proposed Action, the alternatives to the Proposed Action, and the No Action Alternative. The discussion of the Proposed Action considers the three major areas where construction activities would be concentrated: Malmstrom AFB, the existing Minuteman launch facilities, and the associated deployment area road network. The section concludes with a summary of the Proposed Action and alternatives.

1.3.1 Small Intercontinental Ballistic Missile and the Hard Mobile Launcher

The Small ICBM (Figure 1.3.1-1) will be effective against hardened military targets and will be small and light enough to facilitate basing in a mobile mode. The Small ICBM will be a three-stage, solid propellant, single reentry vehicle missile that will be 53 feet long, 46 inches in diameter, and weigh approximately 37,000 pounds. For comparison, the Peacekeeper, our most modern ICBM, is 71 feet long, 92 inches in diameter, and weighs 195,000 pounds.

The missiles will be carried and protected by HMLs that are designed to enhance survivability. These HMLs (Figure 1.3.1-2) will be about 105 feet long, 14 feet wide, and weigh approximately 230,000 pounds, including the weight of the missile. The HMLs will be capable of traveling on paved, gravel, and dirt roads, and will have off-road capability. For peacetime transportation to and from launch facilities, the HMLs will be reconfigured (fitted with temporary load-bearing wheels) to ensure that loading on each axle is below 18,000 pounds.

1.3.2 Operations Concept

Operations activities are those required to maintain the Small ICBM system in a secure, alert condition. These activities include system status monitoring and control, and operational vehicle movements for maintenance and repair, training, supply, and security (Table 1.3.2-1). Operations activities would occur at the main operating base (Malmstrom AFB) and in the deployment area.

The main operating base would provide the principal command, maintenance, logistics, and personnel support functions for the system. Some existing facilities would be utilized for the Small ICBM program because of similarities between the Minuteman and Small ICBM missions. A fixed launch control center at the main operating base, manned

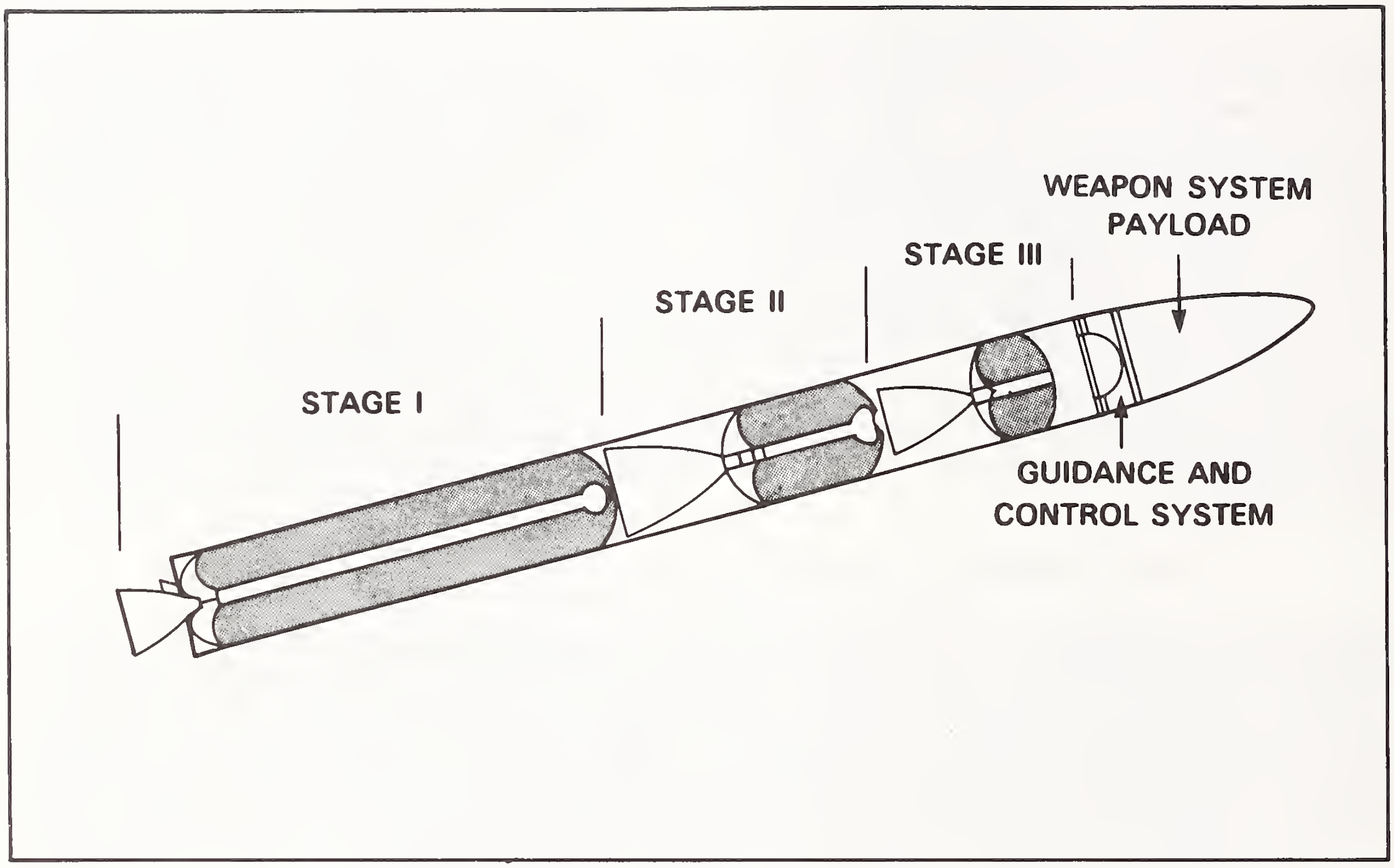


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FIGURE 1.3.1-1 SMALL ICBM

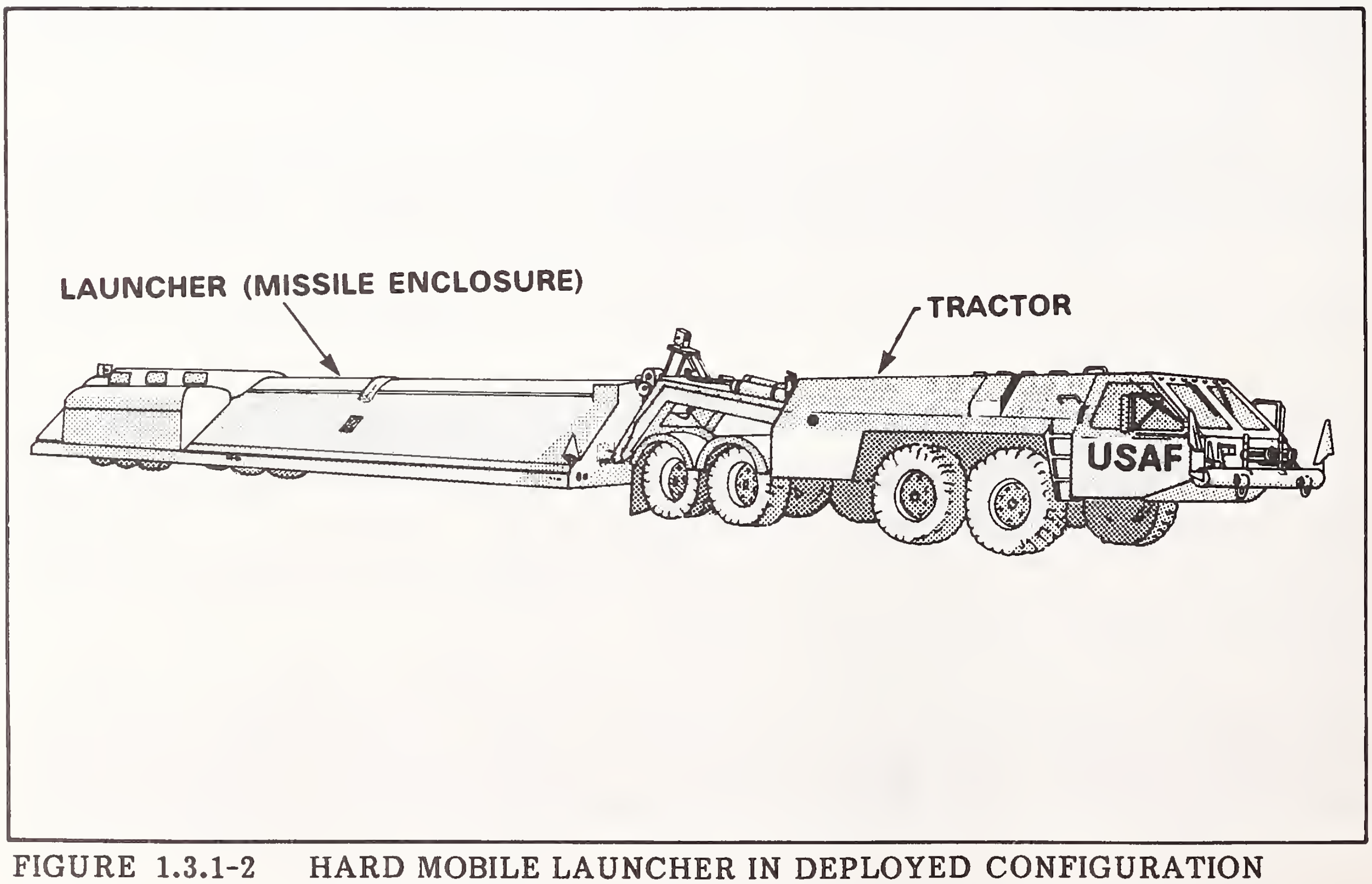

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FIGURE 1.3.1-2 HARD MOBILE LAUNCHER IN DEPLOYED CONFIGURATION (CONCEPTUAL)

Table 1.3.2-1

Vehicle Usage During Small ICBM Operations Phase

Small ICBM Vehicle	Vehicle Type	Vehicle Description: Axles	Vehicle Description: Weight	Trip Frequency
HML Convoy	Tractor-Trailer	N/A[1]	18,000 lb Max/Axle	1 round trip from launch facility to base per year per HML
Safety Vehicle	1/2 to 1 Ton Truck	2	3,000 lb to 8,000 lb Total	1 round trips from launch facility to base per year per HML
Nonmilitary Police Patrol	Police Sedan or Pick-up	2	3,000 lb to 5,000 lb Total	1 round trip from launch facility to base per year per HML
Support and Maintenance	Maintenance Van (5 to 10 Ton)	2/3	18,000 lb Max/Axle	5 round trip from base to launch facility per year per HML
Refueling Vehicle (HML Tractor)	Tanker (5 to 10 Ton)	2/3	18,000 lb Max/Axle	2 round trips per year to launch facility/launch control facility (from fuel-dispensing location)
Crew Replacement Vehicles	4-Wheel Drive Crew Truck	2	5,000 lb to 8,000 lb Total	1 round trip per day from Malmstrom AFB to each launch facility/launch control facility
Security Vehicles	Armored Personnel Carrier or 1-Ton Convoy Vehicle	2	5,000 lb to 15,000 lb	12-26 visits per year per launch facility/launch control facility (from the base) or launch control facility
Water and Wastewater Transport Vehicles	Commercial Tank Trucks	N/A	N/A	1 trip per week between launch facility and local utility sources

Note: [1]N/A = Not Available.

continuously, would provide primary peacetime control of all HMLs within the Minuteman Wing. Strategic Air Command airborne launch control centers and ground mobile launch control centers (GMLCCs) will provide survivable and enduring trans- and post-attack control.

The HMLs would be placed in shelters in dash-ready configuration within expanded fenced areas that surround existing launch facilities. Except for routine maintenance, they would remain at the launch facilities until ordered to disperse. Service and all feasible HML repairs would be performed at the launch facilities, and annual maintenance would be scheduled at the main operating base. Under warning of an attack (a circumstance not covered in this EIS), dispersal of HMLs from the launch facilities could be ordered. The geographically diffused arrangement of the launch facilities would enable the rapid dispersal of the HMLs over a large area.

The HML security system would be integrated with the existing Minuteman system. At present, Minuteman launch facilities are unmanned, but are equipped with intrusion alarms and are frequently checked by roving patrols. The presence of onsite HML crews would increase security for the Minuteman system. Security teams would respond to alarms from the Minuteman system, the HML, or the HML crew. When HMLs are transported on public roads between the launch facilities and the main operating base, they would be escorted by security teams and would be under security response force coverage. Safety escorts would be provided while on public roads during peacetime operations.

Command, control, and communications would be provided by the intra-wing data radio (a secure communications system). The HML would have a tractor-launcher communications link to transfer status and control signals. The tractors would be equipped with voice radios to support dispersal, maintenance, and security operations. The drivers are neither required nor capable of initiating a launch. No additional intersite cables linking the launch facilities would be required for the Small ICBM.

The HML vehicle operations training area at Malmstrom AFB would be used daily, under all weather conditions, in both daylight and darkness. As many as six training vehicles may be operated at the same time. The vehicles would operate on a variety of surfaces and terrains, and would achieve speeds up to 50 miles per hour on a training track. An off-road area would be used for HML emplacements (the "digging-in" operation by which HMLs harden against attack). The training area may be used as many as 240 days per year. In addition, the HML training area may be used for road testing following routine HML maintenance.

1.3.3 Proposed Action

The total number of HMLs to be deployed would depend on a number of factors including progress reached on international arms control agreements. The major facilities required for system operation and support of the initial 200 HMLs would be located at Malmstrom AFB, the main operating base, and its associated existing Minuteman launch facilities. Under the Proposed Action, two HMLs would be located in earth-covered igloos (arched shelters, see Figure 1.3.3-3) at each of 100 launch facilities. The HML drivers would be on alert at all times at each launch facility. The total budgeted cost of the military construction program for Small ICBM deployment on and around Malmstrom AFB is approximately $1 billion (then-year dollars).

Malmstrom AFB is connected to the Minuteman launch facilities by a network of public roads that are designated for use in transporting Minuteman missile components. During peacetime operation, transportation of HMLs would be restricted to these deployment area roads. It is estimated that, on the average, each HML would be transported to Malmstrom AFB once each year.

Some modifications may be required to the deployment area road network and at the launch facilities selected for deployment; launch facility modifications would include expansion and construction of HML shelters and crew housing. Existing safety easements, which prohibit the construction of inhabited structures within 1,200 feet of a launch facility, would have to be expanded. Residential or other occupied structures falling in the expanded safety zone would have to be acquired by the Air Force, unless the requirement is waived at the owner's request. Additional temporary easements for construction activities may be required. Minor improvements to some launch facility access roads may also be necessary.

Proposed construction activities would be concentrated in the following areas:

- Malmstrom AFB;
- The launch facilities; and
- The deployment area road network.

Discussions of the proposed facility requirements in each of these areas are provided in the following sections.

1.3.3.1 Malmstrom Air Force Base

Malmstrom AFB is a Strategic Air Command (SAC) base which operates 150 Minuteman II and 50 Minuteman III launch facilities. Malmstrom AFB is located in north-central Montana, 1.5 miles east of Great Falls (Figure 1.3.3-1). It currently serves as the command, training, and operational and maintenance center for the Wing and provides centralized facilities for missile component storage, assembly, and maintenance. By 1988, an estimated 5,000 military and civilian personnel will be employed at Malmstrom AFB, including personnel assigned to support 16 new KC-135R aircraft.

For the Proposed Action, approximately 3.2 million square feet (sq ft) of new floor space would be constructed at the base to support Small ICBM operations, and existing floor space would require additions and/or modifications to provide an additional 67,000 sq ft. Various roads, utilities, and other support construction would also be required. In addition, approximately 150,000 sq ft of floor space will be added between 1987 and 1989 to support the new KC-135R air refueling mission.

Throughout the siting process, a variety of locations and improvement configurations were considered for onbase facilities. The siting of Small ICBM facilities is based on functional relationships, land use compatibility, and environmental factors. Siting considerations include relationships between Small ICBM, KC-135R aircraft, and Minuteman functions; security; availability of existing facilities; on and offbase land uses; and explosive safety criteria. After considering these factors, an optimal onbase siting plan was developed.

Table 1.3.3-1 provides a list of Small ICBM proposed technical and personnel support facilities. The proposed locations of these facilities are shown in Figure 1.3.3-2. All

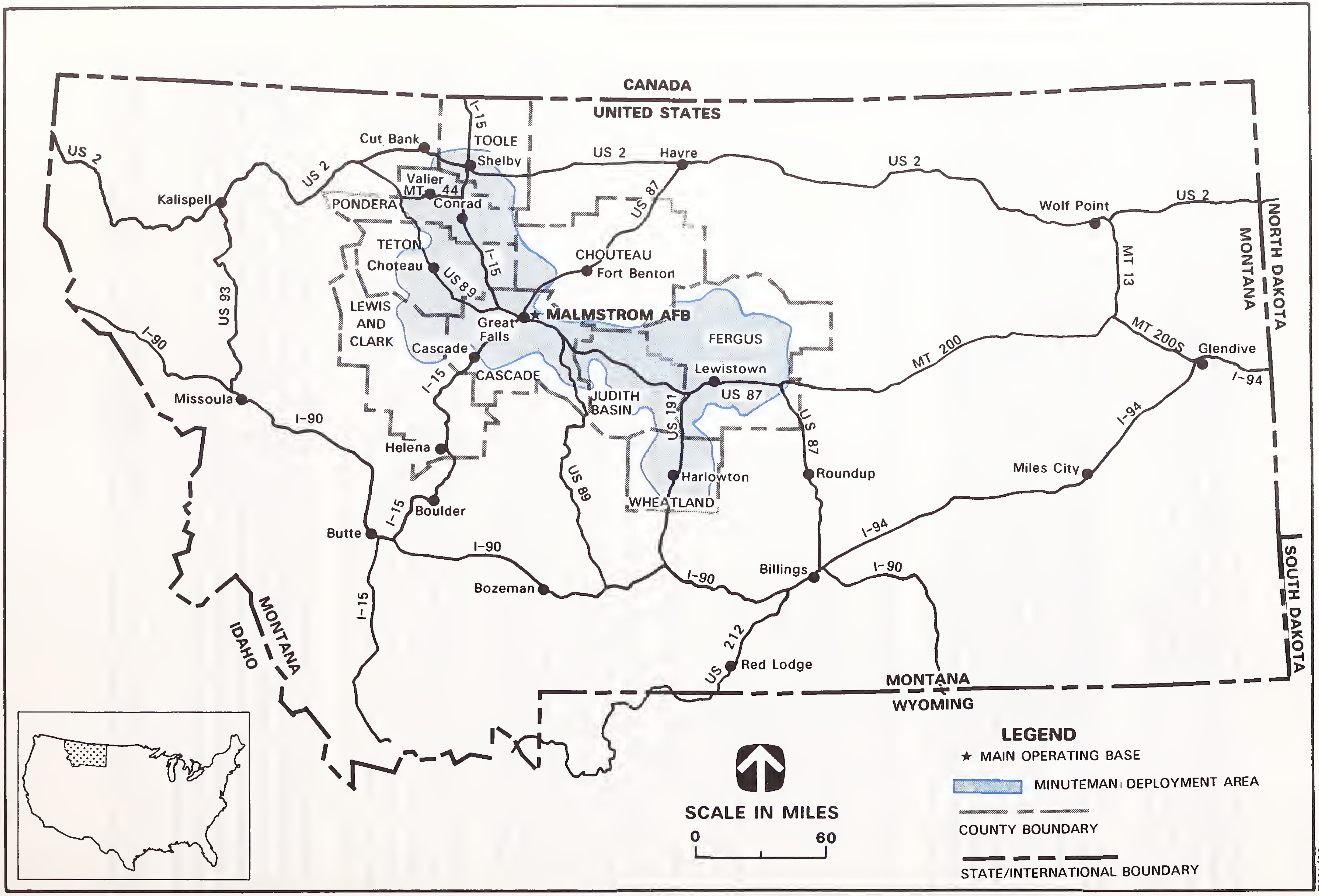

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FIGURE 1.3.3-1 LOCATION OF MALMSTROM AFB AND MINUTEMAN DEPLOYMENT AREA IN MONTANA

Table 1.3.3-1

Proposed Small ICBM Facilities at Malmstrom AFB, Montana

Map Location (see Figure 1.3.3-2)	Facility	Size	Completion Date
	TECHNICAL FACILITIES		
	Operation and Maintenance Facilities		
1	Battery Maintenance/Storage Facility	6,000 sq ft	1992
2	Canisterized Booster Storage Facility	6,500 sq ft	1992
	Electrical Distribution System		1991
3	Electronics Maintenance/Test Facility	5,000 sq ft	1992
4	Fuel Storage	4,500 bbl	1992
	Gas Distribution System		1991
5	GMLCC Maintenance/Storage Facility	13,500 sq ft	1992
6	Hazardous Waste Storage Facility	2,500 bbl	1991
7	HML Maintenance Facility	40,000 sq ft	1991
8	HML Training Area		1992
9	Integrated Support Complex	100,000 sq ft	1991
10	Maintenance Shops, Maintenance Support, Equipment Storage	30,000 sq ft	1992
11	Mechanical Maintenance Facility	15,000 sq ft	1992
12	Open Storage	75,600 sq ft	1992
25	Operational Support Center	73,000 sq ft	1991
	Roads	3 mi	1991
	Sanitation System		1991
13	Shops	18,000 sq ft	1991
	Facility Storm Drains		1991
14	Trainer and Instruction Facility	110,000 sq ft	1992
	Water Supply System		1991
	Weapons Storage Area Facilities		
	Area Lighting	30 each	1991
	Electrical Distribution System		1991
15	Entry Control	1,000 sq ft	1992
	Gas Distribution System		1991
16	HML Checkout Pad	7,400 sq ft	1992
17	Munitions Supply/Inert Storage	6,100 sq ft	1992
18	Propulsion Equipment Module Assembly	2,000 sq ft	1992
	Roads	1 mi	1991
19	Assembly, Surveillance, and Inspection	21,000 sq ft	1991
20	Reentry Vehicle/Shroud Reentry Vehicle Payload Module Assembly Storage Facility	2,500 sq ft	1992
	Sanitation System		1991
	Security Fencing	9,600 ft	1991
	Security Lighting	24 each	1991
21	Security Response Master Surveillance Facility	4,000 sq ft	1992
22	Standby Power Facility	1,500 sq ft	1991
23	Storage Magazine	1,200 sq ft	1992
24	Vehicle & Canister Integration	84,000 sq ft	1992
	Water Supply System		

Table 1.3.3-1 Continued, Page 2 of 2

Map Location (see Figure 1.3.3-2)	Facility	Size	Completion Date
	PERSONNEL SUPPORT FACILITIES		
27	Airmen Dining Hall	12,900 sq ft	1991
28	Airmen Dorm	199,092 sq ft	1992-1995
29	Base Civil Engineer Administration (Addition/Alteration)	54,000 sq ft	1992
30	Base Civil Engineer Open Storage	50,000 sq ft	1992
31	Unaccompanied Officers' Quarters	12,000 sq ft	1995
32	Civilian Base Personnel Office (Addition/Alteration)	25,240 sq ft	1992
33	Chapel (Addition/Alteration)	8,000 sq ft	1993
34	Comptroller (Addition/Alteration)	3,000 sq ft	1992
35	Consolidated Support Administration	10,900 sq ft	1992
	Electrical Distribution System		1991-1992
36	Exchange Branch	7,000 sq ft	1995
37	Family Housing (1,746 Units at 1,100 sq ft)	1,920,600 sq ft	1992-1995
38	Fire Station	8,400 sq ft	1993
39	Fuel Storage (4 Tanks at 10,000 gal)	40,000 gal	1993
40	Child Development Center (Addition/Alteration)	5,000 sq ft	1993
	Gas Distribution System		1991-1992
	Heat Plant/Distribution (Addition/Alteration)		1991-1992
41	Housing Supply/Storage	4,800 sq ft	1992
42	Open Mess, Noncommissioned Officer (Addition/Alteration)	13,000 sq ft	1992
43	Open Mess, Officer (Addition/Alteration)	13,000 sq ft	1992
44	Open Storage, Freight/Traffic	6,500 sq ft	1991
45	Open Storage, Base Supply	14,985 sq ft	1991
46	Petroleum, Oil, and Lubrication Operations	12,488 sq ft	1993
47	Recreation Center	11,000 sq ft	1993
	Roads/Streets	11 mi	1991-1992
	Sanitation System		1991-1992
48	Small Arms Range		1992
49	Security Police Consolidated Group Facility	46,000 sq ft	1991
50	Security Police Kennel/Training Building		1992
51	Store, Commissary	30,000 sq ft	1992
	Storm Drain System		1991-1992
52	Communications Maintenance	13,100 sq ft	1992
53	Traffic Management Facility	20,000 sq ft	1991
54	Visiting Airmen Quarters	10,000 sq ft	1993
55	Vehicle Heated Storage	20,000 sq ft	1992
56	Vehicle Maintenance Shop	36,555 sq ft	1992
57	Vehicle Operations Parking Shed	24,200 sq ft	1992
	Water Distribution System		1991-1992
58	Warehouse Supply and Equipment, Base	45,000 sq ft	1992

facilities would be built within the existing boundaries of the base with the exception of the HML vehicle operations training area and new base housing. The proposed general locations for the housing area and the HML training area are illustrated in Figure 1.3.3-2.

The majority of the technical facilities would be constructed between 1990 and 1992 on the southeast side of the Malmstrom AFB runway, within or adjacent to the existing Minuteman Weapons Storage Area (WSA). The WSA would be expanded to accommodate Small ICBM weapon assembly and storage facilities. The HML vehicle operations training area would be constructed outside of the WSA and outside of the explosive safety zones generated by the expanded WSA. Technical facilities located on the west side of the runway would not require HML access.

The HML vehicle operations training area would occupy about 600 acres on the southeast side of Malmstrom AFB and would require an expansion of the base near the WSA. The HML vehicle operations training area would consist of training roads, HML maneuver areas, classrooms, and shelters for the HML training vehicles. The exact size and configuration of the training area will be determined during the final design process. The major elements of the training facility include a driver training track, off-road maneuver areas consisting of varied slope transitions and terrain obstacles, simulated launch facility/launch control facility access roads and HML enclosures, and realistic operational dash roads. Buildings constructed within the training area would contain computerized vehicle simulation equipment, classrooms, training administration space, and HML trainer vehicle garages.

Personnel support facilities would be sited on the northwest side of the airfield and would be integrated within the existing support complex, with the exception of military family housing. Approximately 425 military family housing units would be constructed each year starting in 1991 and ending in 1994. In total, 1,746 units are planned, which would require additional land next to and north of the existing Capehart family housing. Two housing options (designated as H1 and H2) have also been considered: H1 would provide 873 additional military family housing units, and H2 would provide no additional onbase military family housing. The housing options are discussed further in Section 1.3.4.2. Construction of personnel support facilities planned for the base would start in 1991 and would be completed by 1995. Some facility requirements would be satisfied by adding to or altering existing facilities while other requirements would be met by the construction of new facilities.

Infrastructure improvements for technical and personnel support facilities would begin in 1990 and would be completed by 1994. Upgrades and extensions to utility distribution systems would involve electrical, natural gas, water, sewage, and high temperature hot water. The base coal-fired central heat plant would receive an additional boiler in 1992.

Base road improvements include widening Goddard Avenue from the main gate to the perimeter road near the central heat plant, modifying connections from the personnel support area to the perimeter road leading to the WSA, and improving the roads on the east side of the base from the WSA to their connection with U.S. 87/89 east of Great Falls. Local streets connecting Great Falls with the main gate on Goddard Avenue may require improvements and the county road leading to the industrial north gate may require relocation to make room for the additional military family housing.

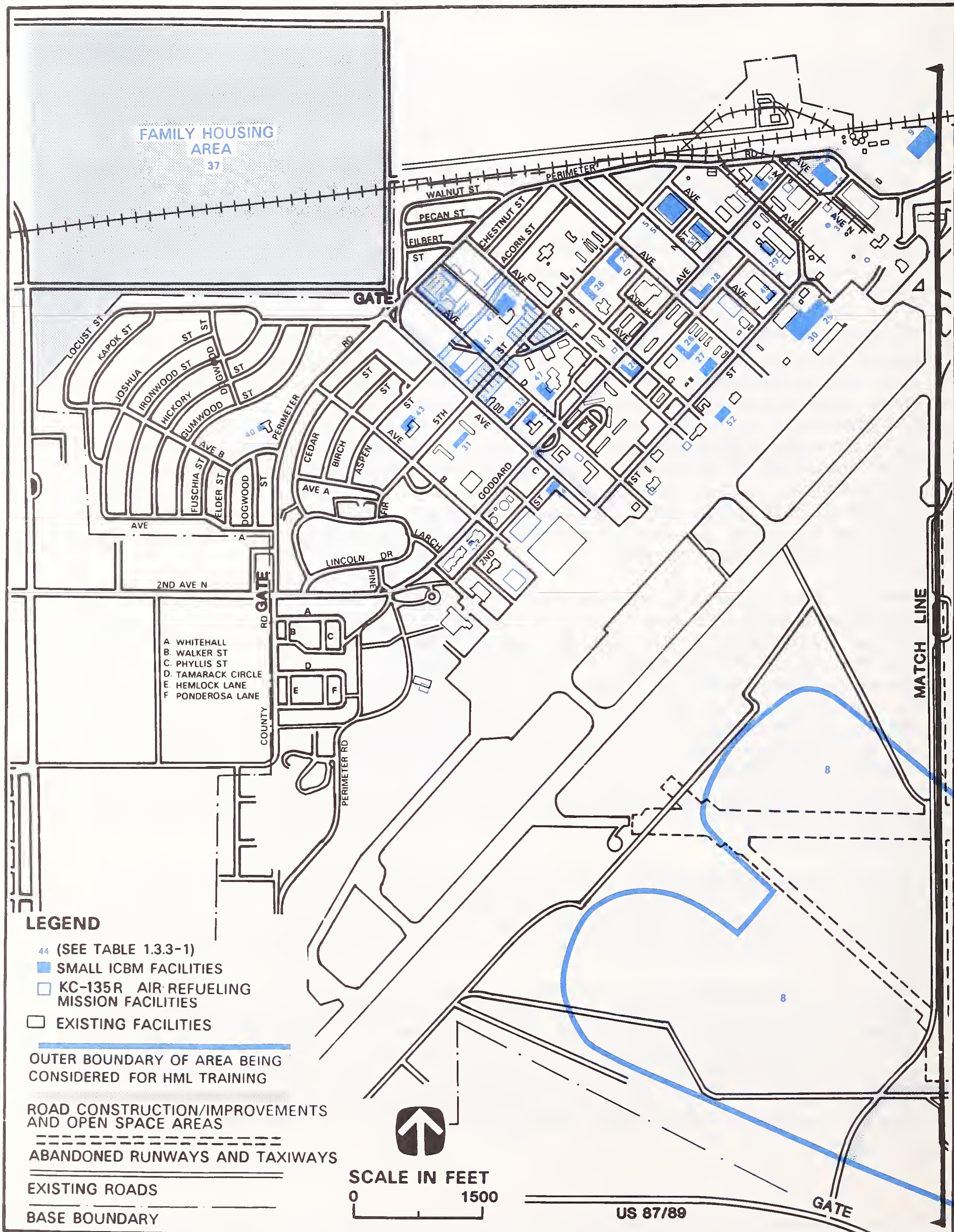

FIGURE 1.3.3-2 PROPOSED SMALL ICBM FACILITIES AT MALMSTROM AFB, MONTANA

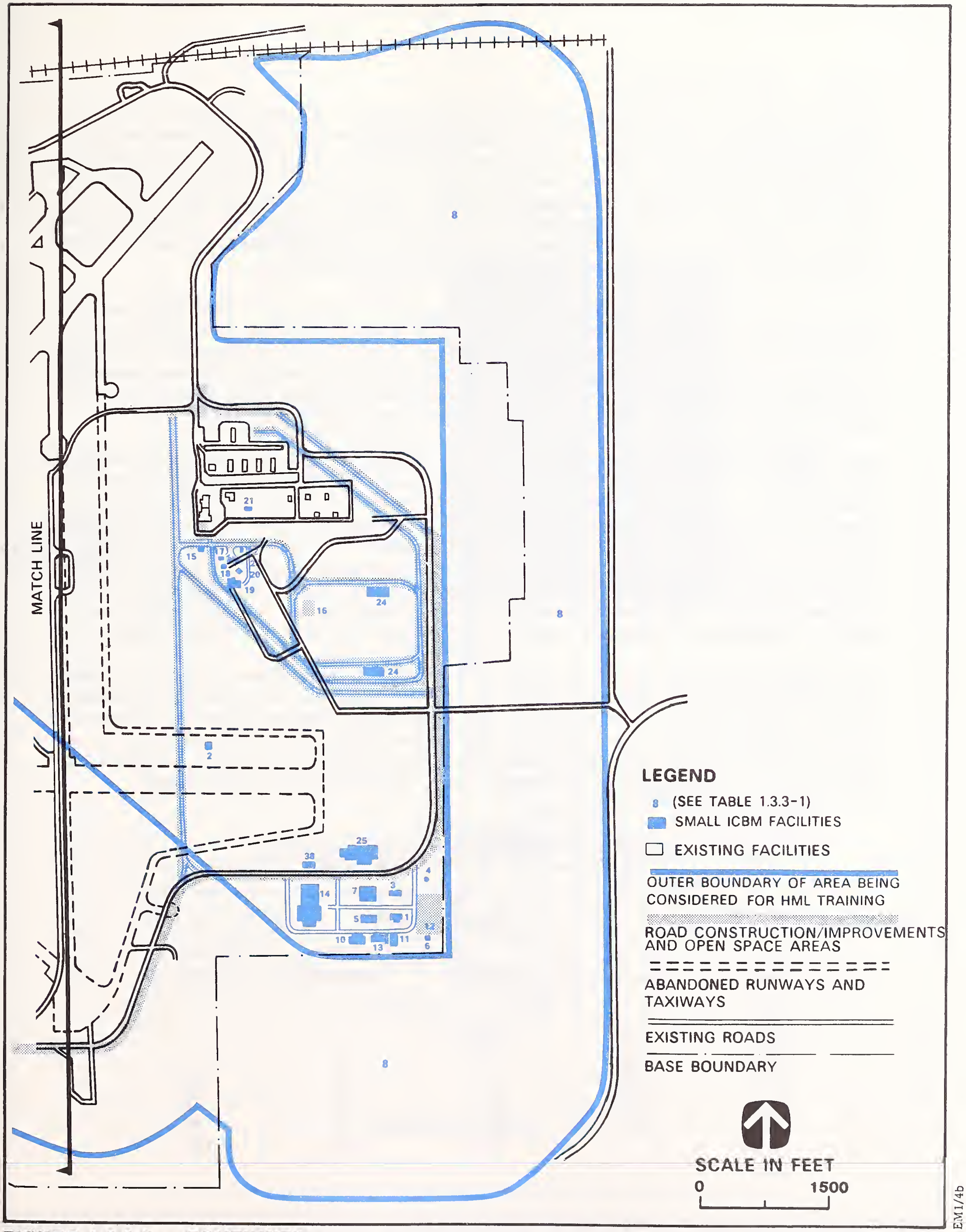

FIGURE 1.3.3-2 CONTINUED

1.3.3.2 Launch Facilities

Minuteman launch facilities are unmanned missile sites, which are generally situated in sparsely populated rural areas. Each launch facility is inside a fenced area occupying from 1 to 3.3 acres. Within this area are the silo, four security antennas, a UHF antenna, an underground launcher support building, and a service area. The silo includes the launch tube, the launcher closure, dual-level equipment room, and provisions for personnel access. The site is also provided with access roads and vehicle maneuvering areas. A gravel-covered service area surrounding the silo and launcher support building is used primarily for maintenance vehicle maneuvering and parking.

Ten unmanned Minuteman launch facilities make up a missile flight. Each flight receives primary support and control from a manned launch control facility. Each launch control facility contains a buried launch control center (which is hardened against attack) and aboveground support buildings. Each launch control facility is within a fenced 5-acre site and includes parking for a number of trucks and vehicles, including limited space for larger maintenance vans and transporter erector-emplacer vehicles.

Small ICBM construction activities at existing Minuteman launch facilities in Montana would begin in the spring of 1991 when nine launch facilities are scheduled for site improvements. Initial construction at each launch facility would involve cut-and-fill operations to prepare the launch facilities for the addition of two earth-covered igloos and a crew support facility. In addition, some launch facility access roads would be widened to provide for HML movements. Improvements would also be made to the site and commercial electrical power distribution system from the utility connection point to the new facilities. Security teams would be present during launch facility modifications. The schedule for launch facility modifications is provided in Table 1.3.3-2.

Each launch facility would be enlarged and the existing security fence would be relocated and extended to enclose this area. Launch facility expansion would vary with location, typically ranging from 1 to 2.5 acres. Two earth-covered igloos would be constructed near the existing Minuteman launch facility (Figure 1.3.3-3). A concrete masonry unit crew quarters would be constructed near the earth-covered igloos. Packaged crew life-support systems including air conditioning, water, and sanitation would be added.

Table 1.3.3-2
Schedule of Launch Facility Modifications in Montana for the Proposed Action

	Launch Facilities			
Year	Started	Completed	Under Construction	Total Completed
1990				
1991	9	0	9	
1992	16	9	25	9
1993	25	16	41	25
1994	30	25	55	50
1995	20	30	50	80
1996		20	20	100
1997				

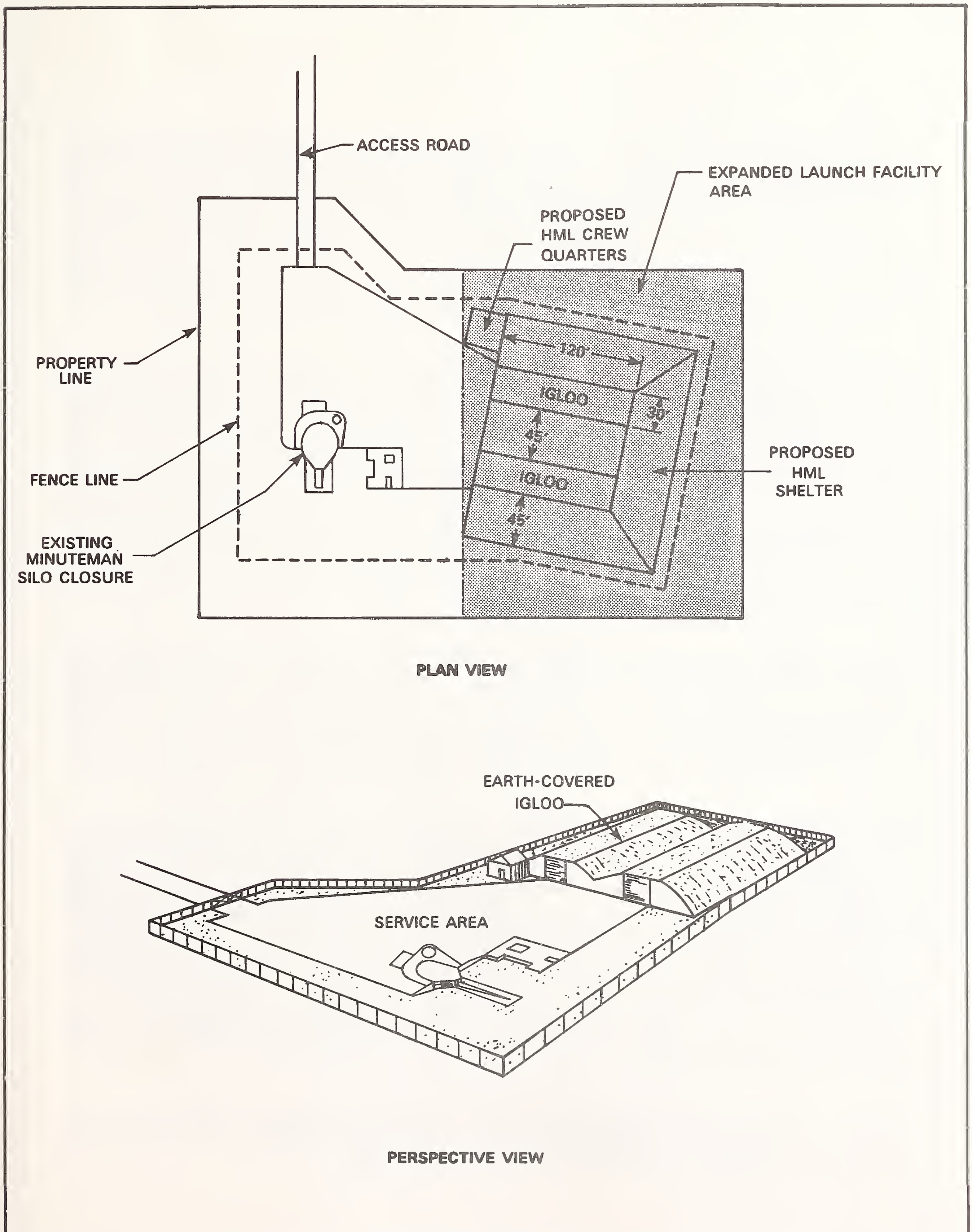

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FIGURE 1.3.3-3 LAUNCH FACILITY MODIFICATION CONCEPT FOR THE SMALL ICBM

1.3.3.3 Deployment Area Roads

A system of designated roads in the deployment area is presently used to transport Minuteman missile components to launch facilities using a transporter erector-emplacer vehicle (Figure 1.3.3-4). These designated transporter/erector (T/E) routes are also used by roving security patrols and missile maintenance teams. The T/E routes include state-owned interstate and primary and secondary roads, county roads, and city streets. Of the 1,707 miles of deployment area roads in the T/E route network, 609 miles are state roads, another 1,090 miles are county roads, and there are 8 miles of city streets. Most roads in the state system are paved, two-lane highways at least 24 feet in width, whereas only about 22 percent of the county roads are paved. All city streets are paved.

Public road improvements within the deployment area to support Small ICBM traffic would be limited to the T/E routes. Prior to construction, a formal process involving the Federal Highway Administration, state and local transportation agencies, Military Traffic Management Command, and the Air Force would determine specific road improvements, locations, and resources. In the interim, estimates have been made regarding anticipated changes required to accommodate the Small ICBM mission. Some intersections along the routes may require widening and some cattle guards and culverts may be replaced. Intersection widening may be accomplished at about 240 locations to accommodate the HML transporter. Road improvements are scheduled to begin in the spring of 1990 along the roads leading to the first launch facilities that would receive HMLs. Public road improvement activities would increase in 1991, peak in 1993, and be complete by the fall of 1994.

There are 315 bridges throughout the T/E route network. Of these bridges, as many as 124 may require modification or replacement to support the HML. Bridge work would begin in the spring of 1990 on those bridges leading to the first launch facilities scheduled for modification. Bridge replacement activities would increase in 1991 and 1992, and peak in 1993. Construction work on bridges would be completed by the fall of 1994. In addition to bridge improvements, as many as 310 culverts throughout the T/E route network may be reinforced or replaced.

Individual bridge replacement may require interruptions to daily traffic. These interruptions would be minimized through the use of detours or by alternating direction of traffic via a single open lane. Alternate routes would be used where available. In some instances, temporary detour roads with temporary bridges would be built near the bridge construction site to accommodate daily traffic during bridge replacement. Road and bridge construction would require some temporary disturbances along the public right-of-way. Temporary disturbance areas averaging 0.5 acre would be required for the storage of construction equipment and material stockpiles. These areas may also include small onsite construction offices. Minor operational equipment maintenance would be accomplished on these sites. Used engine oils, equipment hydraulic fluids, and other maintenance debris generated at these sites would be contained and transported to approved disposal locations.

Electrical power upgrade may be required for high-voltage lines and distribution lines throughout the Minuteman deployment area. In addition, transformers and substations may be added throughout the electrical distribution system.

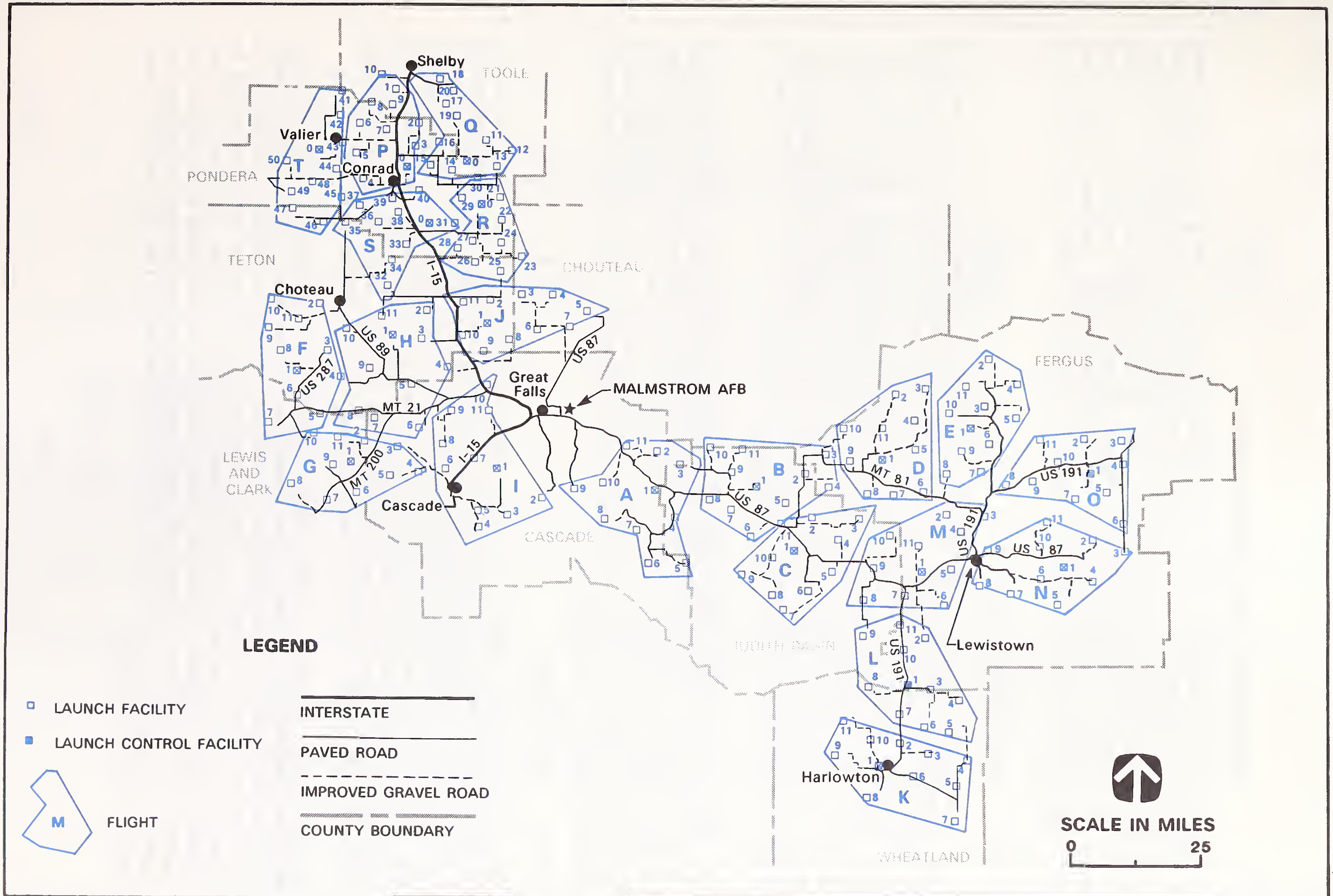


FIGURE 1.3.3-4 NETWORK OF PUBLIC ROADS USED BY TRANSPORTER ERECTOR-EMPLACER VEHICLES FOR ACCESS TO MALMSTROM AFB MINUTEMAN LAUNCH FACILITIES IN MONTANA

1.3.4 System Alternatives and Siting Options

In addition to the Proposed Action, both system alternatives and siting options were considered. System alternatives involve major system considerations such as the number of missiles to be deployed. Siting options involve individual siting decisions within the Proposed Action, including selection of launch facilities and construction of housing units. As discussed in Section 1.1, environmental documentation in support of the basing mode and deployment location decisions for initial deployment of the Small ICBM system were provided in the LEIS. Therefore, deployment location or basing mode alternatives are not analyzed in this EIS.

1.3.4.1 System Alternatives

In developing the Proposed Action and its alternatives, a variety of system variables were considered. These variables included the total number of HMLs to be deployed throughout the Minuteman Wing (200 or 250), the number of HMLs to be deployed at each launch facility (1 or 2), the type of HML enclosures to be constructed at the launch facilities (earth-covered igloos or pre-engineered metal buildings), and the number of operations personnel required (which will depend on the number of personnel at each launch facility). Evaluation of combinations of these factors led to the selection of three system alternatives for analysis which, along with the Proposed Action, represent the range of anticipated environmental impacts. The Proposed Action with the housing options and the system alternatives are compared in Table 1.3.4-1.

The system alternatives were analyzed to identify the range of expected environmental consequences of the Small ICBM program at Malmstrom AFB. The Proposed Action and other alternatives that can be generated from various combinations of the system variables under consideration would have resource requirements that are generally greater than that of Alternative 1 and less than Alternative 2. Alternative 3 would have the largest amount of surface disturbance in the deployment area, with all 200 launch facilities requiring modification.

1.3.4.2 Siting Options

Siting options provide alternate locations where various Small ICBM facilities can be located. As discussed in Section 1.3.2, a wide range of location and conversion options were considered in siting roads and facilities on Malmstrom AFB. For the purposes of this EIS, most facilities are considered to remain in the locations shown in Figure 1.3.3-2. However, two important siting decisions will be aided by the analysis presented in the EIS: launch facility (including roads) selection and the determination of the number of onbase family housing units to be constructed. The environmental consequences of these options, as discussed in this EIS, will be considered in the final siting decisions.

Launch Facility Options. All 200 launch facilities in the Malmstrom AFB Minuteman Wing are considered to be viable siting candidates for the Small ICBM program. Under the Proposed Action or Alternative 1, 100 launch facilities would be modified to accommodate HML enclosures. For Alternative 2, 125 launch facilities would be modified, and for Alternative 3, all 200 launch facilities would be modified to accommodate HML enclosures. Since all launch facilities are considered to be viable siting candidates, both existing conditions and site impacts of the new construction at each are discussed in this EIS. The overall impacts of modifications of 100, 125, and 200 launch facilities are also discussed.

Table 1.3.4-1

Summary of Proposed Action and Alternatives for the Small ICBM Program at Malmstrom AFB, Montana

	No. of Launch Facilities	No. of HMLs Deployed	HMLs per Launch Facility	HML Shelters	Explosive Safety Zone (feet from HML Shelter)	Peak-Year Construction Personnel (1990)	Operations Personnel	Family Housing Provided units (acres)
Proposed Action	100	200	2	Earth-Covered Igloos	1,250	1,080	2,190-3,100[1]	1,746 (330)
Proposed Action With Housing Option H1	100	200	2	Earth-Covered Igloos	1,250	1,080	2,190-3,100[1]	873 (165)
Proposed Action With Housing Option H2	100	200	2	Earth-Covered Igloos	1,250	1,080	2,190-3,100[1]	0 (0)
Alternative 1	100	200	2	Pre-engineered Buildings	1,795	1,080	2,190[1]-3,100	1,230 (232)
Alternative 2	125	250	2	Earth-Covered Igloos	1,250	1,120	2,620-3,760[1]	2,000 (380)
Alternative 3	200	200	1	Pre-engineered Buildings	1,425	1,160	3,100	1,746 (330)
No Action Alternative	0	0	0	-	-	0	0	0 (0)

Note: [1]Selected for environmental analysis (will depend on the number of personnel stationed at each launch facility).

A rigorous launch facility narrowing process is being used to identify those launch facilities that would be selected for the Small ICBM program. The process began with the identification of five major goals: maximize system effectiveness; and minimize operations costs, construction costs, public impacts, and environmental impacts. Criteria were established for each of these goals. After application of criteria the set of launch facilities which best satisfies the goals will be identified.

Housing Options. The Proposed Action and Alternative 3 include a provision for 1,746 additional military family housing units to be constructed in an expanded area of Malmstrom AFB. These units would require the purchase of approximately 330 acres of land next to the existing family housing on the northwest corner of the base (Figure 1.3.3-2). For Alternative 1, an analysis of 1,230 onbase housing units was performed, and 2,000 units were analyzed for Alternative 2.

The amount of military family housing constructed will ultimately be determined by a needs study, and may be limited by budget constraints. Therefore, two additional housing options were analyzed to evaluate the full range of possible consequences resulting from housing Small ICBM inmigrants within the City of Great Falls. Housing Option H1 assumes partial funding of family housing and provides for construction of 873 units. Expansion of Malmstrom AFB to accommodate these units would be accomplished in the same general area northwest of the base. The remaining housing would be provided by the Great Falls community. Housing Option H2 provides for no new family housing onbase, with all needed family housing to be provided by the private sector in the Great Falls area. This option represents the extreme case where all military families are housed in the community.

The housing option selected will determine where many of the operations personnel will reside. This, in turn, will have an influence on the socioeconomic and other consequences of the program. Throughout the EIS, the housing options are discussed in the context of the Proposed Action. The selection of Alternative 2 with no onbase military family housing would lead to a marginal increase in the demand for housing units in the Great Falls community over that analyzed for the Proposed Action with Housing Option H2. For most resource elements, the impacts the community would consequently experience would not differ substantially from those already analyzed under the Proposed Action with Housing Option H2. For those resource elements that would experience more pronounced effects under Alternative 2 with no onbase military family housing, the differences are discussed in Chapter 4.0.

1.3.5 No Action Alternative

Under the No Action Alternative, the Small ICBM will not be deployed. The Air Force will maintain the existing Minuteman ICBMs and the new KC-135R air refueling mission. The scope of such activities will not cause changes in currently projected future conditions in the area under consideration for basing of the Small ICBM. The environmental consequences of the No Action Alternative are discussed in Chapter 4.0 and summarized in Chapter 2.0.

1.3.6 Summary of the Proposed Action and Alternatives

The system alternatives and housing options analyzed in this EIS are summarized in Table 1.3.4-1 (Section 1.3.4). An important difference between the Proposed Action and Alternatives 1 and 2 is the number of operations personnel required. Alternative 1 represents the lowest operational manpower requirement, Alternative 2 the highest, with the Proposed Action and Alternative 3 intermediate. A provision for military family housing has been programmed into the Proposed Action and all three alternatives.

In addition, the Proposed Action includes two options: Housing Option H1 provides 50 percent of programmed housing and Housing Option H2 provides no additional military family housing. Under the No Action Alternative, the Small ICBM would not be deployed at Malmstrom AFB.

1.4 Other Future Air Force Programs at Malmstrom Air Force Base

An air refueling wing, consisting of 16 four-engine KC-135R aircraft, will be deployed at Malmstrom AFB prior to Small ICBM deployment. In addition, Malmstrom AFB is a candidate garrison location for the Peacekeeper in Rail Garrison basing mode. (A garrison is a permanent secure military facility where railroad trains carrying Peacekeeper missiles will be housed during peacetime operation.)

1.4.1 The KC-135R Air Refueling Mission

The Air Force will deploy a KC-135R air refueling wing with its operational, maintenance, and associated support organizations at Malmstrom AFB in the last quarter of 1988. Sixteen KC-135R aircraft will be located on existing aircraft parking space and will use renovated and newly constructed aircraft operation and maintenance facilities at Malmstrom AFB. Facility renovation and modification work on these flightline facilities and the former Directional Control Center will be required. To support the proposed KC-135R air refueling mission, a new aircraft corrosion control maintenance hanger, consolidated aircraft maintenance shops, and heated vehicle storage facilities will also be required (Figure 1.3.3-2). Additions to the existing base fire station and vehicle maintenance shops will be required to accommodate the new, larger flightline crash/fire-fighting equipment and the additional assigned vehicles required to support the KC-135R air refueling mission. Building alterations and renovation work are required in six existing flightline facilities to support operational and maintenance activities of the KC-135R air refueling mission. The aircraft hydrant refueling system and associated bulk petroleum product storage will be upgraded to satisfy the KC-135R aircraft operational requirements.

An environmental assessment of the KC-135R air refueling program at Malmstrom AFB was prepared and released by the Air Force; therefore, no further consideration of these environmental impacts is provided in this EIS. However, the facilities and manpower requirements were considered in the evaluation of future baseline conditions for the Small ICBM at Malmstrom AFB. For example, the housing analysis includes a consideration of how much of the currently available housing in Great Falls could be used by personnel associated with the KC-135R deployment.

1.4.2 Peacekeeper in Rail Garrison

Malmstrom AFB is one of ten Air Force bases being considered as a deployment location (in addition to the main operating base at F.E. Warren AFB, Wyoming) for the Peacekeeper in Rail Garrison basing mode. If Malmstrom AFB is selected as a rail garrison location, four train enclosures (Figure 1.4.2-1) would be constructed within a fenced area occupying 125 acres in the southeast portion of the base (Figure 1.4.2-2). Personnel support facilities and other technical facilities would occupy about 285,000 sq ft of floorspace elsewhere on the base. Under normal peacetime conditions, the Peacekeeper missiles would be maintained in a continuous strategic alert status within the garrison enclosures. Upon strategic warning, the missiles could be dispersed over the existing nationwide commercial rail network. Approximately 317 military and civilian personnel

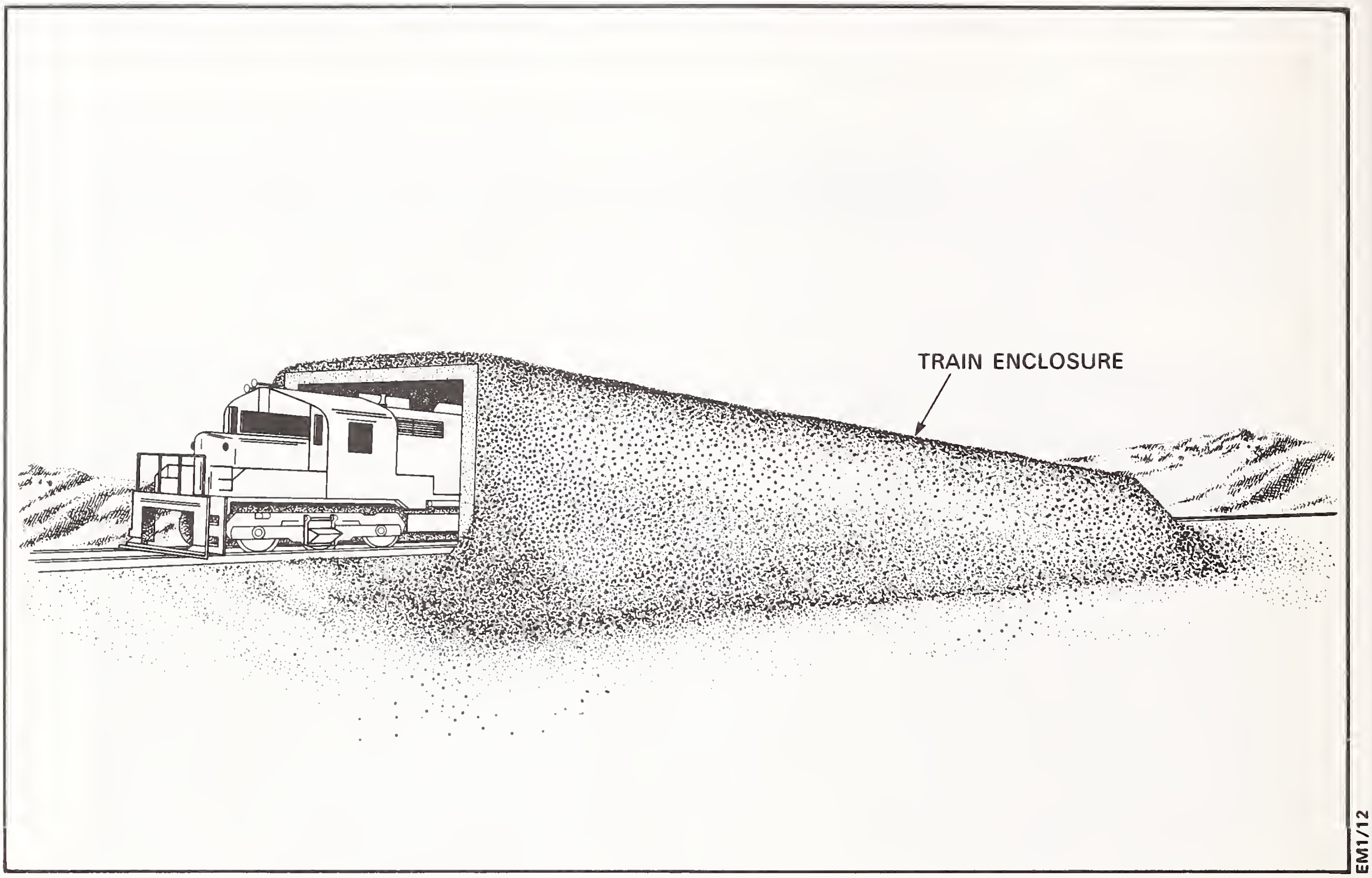


FIGURE 1.4.2-1 PEACEKEEPER IN RAIL GARRISON BASING CONCEPT

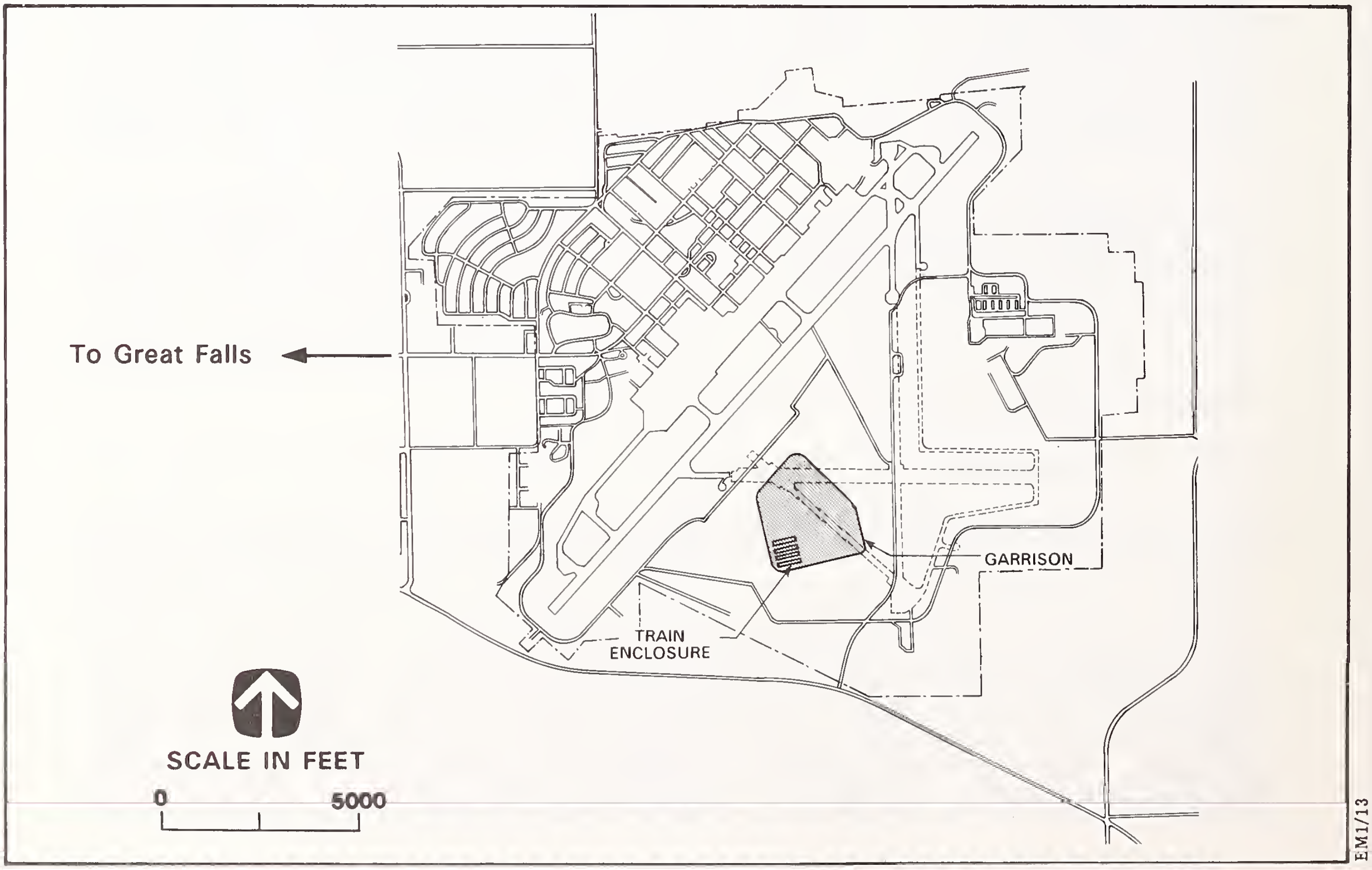


FIGURE 1.4.2-2 APPROXIMATE LOCATION OF POTENTIAL PEACEKEEPER IN RAIL GARRISON TECHNICAL FACILITIES AT MALMSTROM AFB, MONTANA

would be required to support the garrison at Malmstrom AFB. The budgeted cost for construction of Peacekeeper in Rail Garrison at Malmstrom AFB is estimated at $124 million.

A separate EIS will be prepared for the entire Peacekeeper in Rail Garrison program. For the purposes of the present analysis, the cumulative environmental consequences of the Small ICBM and Peacekeeper programs at Malmstrom AFB are discussed in Chapter 4.0. For example, after housing requirements for the Small ICBM program are analyzed, the added effect of Peacekeeper personnel are evaluated.

1.5 Deployment Activities and Requirements

This section describes the following deployment activities and requirements: program schedule, facility construction, assembly and checkout, and program resource requirements.

1.5.1 Program Schedule

The Small ICBM would require approximately 6 years of construction activities in the deployment area, followed by 20 or more years of operations. Key elements of the program schedule for the Proposed Action are identified in Table 1.5.1-1. Alternative 1 would have a schedule similar to the Proposed Action. The schedule for Alternative 2 would also be similar, but the completion dates for some activities would be later.

A detailed phasing schedule for launch facility modifications and road improvements will be developed as part of the deployment effort as the program progresses. For the

Table 1.5.1-1

Proposed Action Schedule of Small ICBM Activities in Montana

Activity	Schedule	
	Begin	End
Technical Facility Construction at Malmstrom AFB	Spring 1990	Fall 1992
Personnel Support Facility Construction at Malmstrom AFB	Spring 1990	Fall 1995
Launch Facility Modifications	Spring 1991	Fall 1996
Road and Bridge Improvements	Spring 1990	Fall 1994
First 10 Missiles Operational (Initial Operational Capability)	Summer 1992	Late 1992
Final 10 Missiles Operational	Early 1997	Spring 1997

purposes of environmental analysis, it was assumed that road and launch facility. construction closest to the base will be accomplished first. Construction activities would then move to missile flights in the northwest portion of the deployment area and finally to the flights in the southeast portion.

1.5.2 Facility Construction

Small ICBM system facilities would be specified by the Air Force and designed and constructed by the Army Corps of Engineers (COE). Some facilities essential for initial deployment would have special requirements and their construction must begin early. This effort would occur at Malmstrom AFB and the associated deployment area. Early efforts at the base and in the deployment area may also include construction of access roads and utilities where these are nonexistent or inadequate. Personnel support facilities at the base would be phased to provide accommodations for operations personnel. Offbase construction efforts would consist of modification of launch facilities including commercial power upgrade to accommodate HMLs and roadway improvements necessary for base-to-launch facility HML movements. These activities would involve a small number of launch facilities at any one time, and would require a stable level of effort until the system is fully deployed. Estimates of heavy construction traffic and fuel use for the Proposed Action are provided in Table 1.5.2-1.

Table 1.5.2-1

Heavy Construction Traffic and Fuel Use for the Small ICBM Program in Montana Proposed Action

	Proposed Action		
Calendar Year	Haul Trucks (ADT)[1]	Construction Equipment (No./Day)	Fuel Consumption (Gal/Day)
MALMSTROM AFB			
1990	32	175	1,418
1991	72	141	1,322
1992	24	112	908
1993	24	104	861
1994	24	48	464
DEPLOYMENT AREA			
1990	184	197	2,327
1991	208	246	2,779
1992	152	273	2,657
1993	152	214	2,258
1994	96	108	1,253
1995	16	19	216

Note: [1]ADT = average daily traffic.

1.5.3 Assembly and Checkout

Assembly and checkout is managed by the Air Force and conducted with contractor support. The process begins with receipt of hardware items which are inspected and then assembled or installed as appropriate. Completed items are then integrated into the system and further checked for proper performance. After final acceptance tests, operationally ready missiles are turned over to SAC.

The assembly and checkout at each launch facility would be supported from Malmstrom AFB. Materials and personnel would be transported to and from the launch facility with commercially available transport vehicles. Personnel, maintenance, retrieval, and security vehicles would be used to support the initial HML demonstration (to verify that vehicles meet design and performance specifications) and delivery of the missile system. Demonstration and delivery would be performed for the first five HMLs and would occur in 1992.

1.5.4 Program Resource Requirements

Small ICBM construction and operations would cause environmental impacts which would include disturbance of the earth's surface, consumption of materials such as water and aggregate, and inmigration of workers. This section identifies the estimated program requirements used in this environmental analysis.

Annual direct employment estimates for the Proposed Action and Alternatives 1, 2, and 3 are presented in Table 1.5.4-1. Activities shown include construction, assembly and checkout, site activation, and operations. Construction workers were assumed to be civilian, whereas operations workers would be military. Assembly and checkout workers would be mostly civilian, whereas the Site Activation Task Force would be primarily military. The employment estimates are based on Army COE and Air Force experience on similar programs. Total projected population growth in the deployment area resulting from direct employment is presented in Chapter 4.0.

Road, bridge, and launch facility modifications would require water and coarse and fine aggregate from sources within the deployment area. Water and aggregate would also be required for onbase construction. Water would be required for construction, compaction, concrete, dust control, and revegetation. Aggregate pit locations would be selected from known aggregate sources within a reasonable haul distance of each construction site. Water sources would be identified by construction contractors and haul distances would be minimized. Known aggregate and surface and subsurface water sources are identified in Chapter 3.0. Construction resources for facilities at Malmstrom AFB are summarized in Table 1.5.4-2 and resources for facilities to be constructed in the deployment area are summarized in Table 1.5.4-3.

Approximate areas of disturbance are identified in Table 1.5.4-4 for Malmstrom AFB, the launch facilities, and the deployment area roads for the Proposed Action. The area disturbed by Alternative 1 would be slightly less than the Proposed Action; the areas disturbed by Alternatives 2 and 3 would be slightly greater than the Proposed Action. Surfaces that would be covered by impervious materials or kept in a cleared condition to accommodate buildings, parking lots, roads, training areas, and security zones are considered permanently disturbed. Surfaces disturbed during construction, but later regraded or revegetated, or those able to return to a natural state during the operations phase of the program, are considered to be temporarily disturbed. In the calculation of

Table 1.5.4-1

Total Estimated Annual Direct Employment, Military and Civilian, for the Small ICBM Program in the Malmstrom AFB Area By Calendar Year (Full-Time Equivalent Jobs)

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
PROPOSED ACTION													
Malmstrom AFB													
Site Activation	10	20	20	60	80	100	100	100	100	60	10	0	0
Construction	0	0	840	470	490	460	90	0	0	0	0	0	0
Assembly & Checkout	0	0	0	0	310	190	280	310	230	100	0	0	0
Operations	0	0	0	250	1,100	1,630	1,940	2,440	3,100	3,100	3,100	3,100	3,100
Minuteman Deployment Area													
Construction	0	0	240	340	320	330	150	20	0	0	0	0	0
TOTAL:	10	20	1,100	1,120	2,300	2,710	2,560	2,870	3,430	3,260	3,110	3,100	3,100
ALTERNATIVE 1													
Malmstrom AFB													
Site Activation	10	20	20	60	80	100	100	100	100	60	10	0	0
Construction	0	0	830	440	420	380	80	0	0	0	0	0	0
Assembly & Checkout	0	0	0	0	310	190	280	310	230	100	0	0	0
Operations	0	0	0	250	970	1,300	1,500	1,780	2,190	2,190	2,190	2,190	2,190
Minuteman Deployment Area													
Construction	0	0	250	360	370	350	160	30	0	0	0	0	0
TOTAL:	10	20	1,100	1,110	2,150	2,320	2,120	2,220	2,520	2,350	2,200	2,190	2,190
ALTERNATIVE 2													
Malmstrom AFB													
Site Activation	10	20	20	60	80	100	100	100	80	100	100	60	10
Construction	0	0	860	500	570	530	100	0	0	0	0	0	0
Assembly & Checkout	0	0	0	0	310	190	240	210	170	160	150	80	0
Operations	0	0	0	250	1,100	1,640	1,970	2,550	3,580	3,760	3,760	3,760	3,760
Minuteman Deployment Area													
Construction	0	0	260	380	430	440	300	70	0	0	0	0	0
TOTAL:	10	20	1,140	1,190	2,490	2,900	2,710	2,930	3,830	4,020	4,010	3,900	3,770
ALTERNATIVE 3													
Malmstrom AFB													
Site Activation	10	20	20	60	80	100	100	100	100	60	10	0	0
Construction	0	0	840	470	490	460	90	0	0	0	0	0	0
Assembly & Checkout	0	0	0	0	310	190	280	310	230	100	0	0	0
Operations	0	0	0	250	1,100	1,630	1,940	2,440	3,100	3,100	3,100	3,100	3,100
Minuteman Deployment Area													
Construction	0	0	320	360	480	410	250	70	0	0	0	0	0
TOTAL:	10	20	1,180	1,140	2,460	2,790	2,660	2,920	3,430	3,260	3,110	3,100	3,100

Table 1.5.4-2

Montana Small ICBM Program Construction Resource Requirements for Onbase Facilities

	1990	1991	1992	1993	1994	Total
Proposed Action						
Cement, 1,000 tons	8	10	4	4	4	30
Aggregate, 1,000 tons	80	190	70	60	80	480
Asphalt, 1,000 tons	1	3	<1	3	3	10
Roofing, 1,000 rolls	10	1	20	7	<1	38
Plywood, 1,000 sq ft	600	350	2,660	1,550	9	5,169
Lumber, 1,000 board ft	1,370	2,330	8,170	1,900	20	13,790
Concrete Block, 1,000 sq ft	1,090	170	260	9	20	1,549
Steel, tons	5,170	2,140	1,030	520	500	9,360
Misc. Metal, tons	710	330	50	50	20	1,160
Metal Siding, 1,000 sq ft	930	130	200	1	10	1,271
Pipe, 1,000 linear ft	360	110	1,530	2,120	7	4,127
Wiring, 1,000 linear ft	1,220	3,420	1,370	6,470	20	12,500
Water, acre-ft	11	20	6	8	3	48
Alternative 1						
Cement, 1,000 tons	8	9	3	3	3	26
Aggregate, 1,000 tons	80	170	60	70	60	440
Asphalt, 1,000 tons	1	3	<1	2	2	8
Roofing, 1,000 rolls	10	1	20	6	<1	37
Plywood, 1,000 sq ft	590	320	2,180	1,270	9	4,369
Lumber, 1,000 board ft	1,340	1,940	6,700	1,550	20	11,550
Concrete Block, 1,000 sq ft	1,090	150	220	9	20	1,489
Steel, tons	5,150	2,010	880	430	420	8,890
Misc. Metal, tons	710	330	40	40	20	1,140
Metal Siding, 1,000 sq ft	920	130	170	1	10	1,231
Pipe, 1,000 linear ft	360	100	1,250	1,740	7	3,457
Wiring, 1,000 linear ft	1,210	2,890	1,130	5,290	20	10,540
Water, acre-ft	13	18	5	7	3	46
Alternative 2						
Cement, 1,000 tons	7	11	4	5	4	31
Aggregate, 1,000 tons	80	200	70	80	80	510
Asphalt, 1,000 tons	1	3	<1	3	3	10
Roofing, 1,000 rolls	20	1	20	9	<1	50
Plywood, 1,000 sq ft	640	380	3,080	1,790	9	5,899
Lumber, 1,000 board ft	1,330	2,670	9,450	2,200	0	15,650
Concrete Block, 1,000 sq ft	990	210	330	0	20	1,550
Steel, tons	4,730	2,270	1,230	610	570	9,410
Misc. Metal, tons	640	290	50	70	20	1,070
Metal Siding, 1,000 sq ft	970	140	250	0	0	1,360
Pipe, 1,000 linear ft	370	110	1,760	2,440	0	4,680
Wiring, 1,000 linear ft	1,270	3,870	1,570	7,440	0	14,150
Water, acre-ft	13	20	7	9	4	53
Alternative 3						
Cement, 1,000 tons	8	10	4	4	4	30
Aggregate, 1,000 tons	70	180	60	70	70	450
Asphalt, 1,000 tons	1	2	<1	3	3	9
Roofing, 1,00 rolls	12	1	20	7	<1	40
Plywood, 1,000 sq ft	660	330	2,660	1,550	9	5,209
Lumber, 1,000 board ft	1,380	2,320	8,170	1,900	18	13,788
Concrete Block, 1,000 sq ft	960	170	260	9	20	1,419
Steel, tons	4,720	2,170	1,030	520	500	8,940
Misc. Metal, tons	630	290	50	50	18	1,038
Metal Siding, 1,000 sq ft	950	130	200	1	10	1,291
Pipe, 1,000 linear fit	360	100	1,530	2,120	7	4,117
Wiring, 1,000 linear ft	1,280	3,400	1,370	6,470	20	12,540
Water, acre-ft	13	19	6	7	3	48

Table 1.5.4-3

Montana Small ICBM Program Construction Resource Requirements for Deployment Area Facilities

	1990	1991	1992	1993	1994	1995	Total
Proposed Action							
Cement, 1,000 tons	5	7	5	5	4	<1	26
Aggregate, 1,000 tons	590	650	460	470	310	50	2,530
Asphalt, tons	0	1	1	1	4	1	8
Roofing, rolls	0	40	60	90	120	20	330
Plywood, 1,000 sq ft	170	280	700	400	50	4	1,604
Lumber, 1,000 board ft	70	110	170	110	40	10	510
Concrete Block, 1,000 sq ft	0	7	10	40	5	5	67
Steel, tons	5,380	6,150	8,960	2,870	990	90	24,440
Misc. Metal, tons	90	100	280	360	90	6	926
Metal Siding, 1,000 sq ft	0	4	7	20	3	2	36
Pipe, 1,000 linear ft	0	3	6	5	20	2	36
Wiring, 1,000 linear ft	5	10	20	30	20	4	89
Water, acre-ft	80	90	80	80	50	8	388
Alternative 1							
Cement, 1,000 tons	4	7	5	5	4	<1	25
Aggregate, 1,000 tons	590	650	450	470	310	50	2,520
Asphalt, tons	30	30	90	240	160	30	580
Roofing, rolls	610	1,250	2,680	930	530	20	6,020
Plywood, 1,000 sq ft	160	270	690	390	60	4	1,574
Lumber, 1,000 board ft	60	140	210	120	50	10	590
Concrete Block, 1,000 sq ft	200	380	370	50	60	5	1,065
Steel, tons	1,230	2,370	2,500	1,360	1,070	90	8,620
Misc. Metal, tons	60	50	210	290	70	6	686
Metal Siding, 1,000 sq ft	80	90	280	20	40	2	512
Pipe, 1,000 linear ft	10	20	60	40	20	2	152
Wiring, 1,000 linear ft	150	150	200	270	60	10	840
Water, acre-ft	70	70	70	60	40	7	317
Alternative 2							
Cement, 1,000 tons	5	7	6	6	5	1	30
Aggregate, 1,000 tons	590	650	460	470	310	60	2,540
Asphalt, tons	0	1	1	2	3	4	11
Roofing, rolls	0	30	50	100	160	160	500
Plywood, 1,000 sq ft	30	280	700	430	80	30	1,550
Lumber, 1,000 board ft	60	110	180	150	90	60	650
Concrete Block, 1,000 sq ft	0	6	10	40	30	20	106
Steel, tons	4,830	6,180	9,620	10,280	1,650	220	32,780
Misc. Metal, tons	80	90	280	410	180	30	1.070
Metal Siding, 1,000 sq ft	0	3	5	20	20	10	58
Pipe, 1,000 linear ft	0	3	4	8	10	20	45
Wiring, 1,000 linear ft	3	9	20	30	30	20	112
Water, acre-ft	80	90	90	80	60	20	420
Alternative 3							
Cement, 1,000 tons	4	6	6	5	4	1	26
Aggregate, 1,000 tons	470	570	550	480	340	110	2,520
Asphalt, tons	12	80	120	220	200	60	692
Roofing, tons	1,060	1,350	2,550	2,090	350	140	7,540
Plywood, 1,000 sq ft	125	240	640	520	100	20	1,645
Lumber, 1,000 board ft	80	140	280	290	30	60	880
Concrete Block, 1,000 sq ft	–	11	50	70	9	20	160
Steel, tons	1,490	2,280	2,860	2,110	1,020	290	10,050
Misc. Metal, tons	50	50	190	290	120	19	719
Metal Siding, 1,000 sq ft	170	200	340	170	1	13	894
Pipe, 1,000 linear ft	18	30	50	80	20	13	211
Wiring, 1,000 linear ft	160	210	250	300	130	18	1,068
Water, acre-ft	50	80	70	70	50	15	335

Table 1.5.4-4

Approximate Areas Disturbed by Small ICBM Facility Construction in Montana

Alternative	Temporary		Permanent		Totals	
	Sq Miles	Acres	Sq Miles	Acres	Sq Miles	Acres
Proposed Action						
Malmstrom AFB	0.50	321	1.31	839	1.81	1,160
Launch Facilities	0.22	140	0.25	160	0.47	300
Deployment Area Roads	1.37	880	0.36	228	1.73	1,108
TOTAL:	2.09	1,341	1.92	1,227	4.01	2,568
Alternative 1						
Malmstrom AFB	0.43	271	1.23	789	1.66	1,060
Launch Facilities	0.22	140	0.25	160	0.47	300
Deployment Area Roads	1.37	880	0.36	228	1.73	1,108
TOTAL:	2.02	1,291	1.84	1,177	3.86	2,468
Alternative 2						
Malmstrom AFB	0.54	348	1.37	878	1.91	1,226
Launch Facilities	0.27	175	0.31	200	0.58	375
Deployment Area Roads	1.37	880	0.36	228	1.73	1,108
TOTAL:	2.18	1,403	2.04	1,306	4.22	2,709
Alternative 3						
Malmstrom AFB	0.50	321	1.31	839	1.81	1,160
Launch Facilities	0.16	200	0.16	200	0.32	400
Deployment Area Roads	1.37	880	0.36	228	1.73	1,108
TOTAL:	2.03	1,401	1.83	1,267	3.86	2,668

surface area disturbance, it was assumed that launch facility expansions would require 1.6 acres of permanent and 1.4 acres of temporary disturbance for two-HML deployment (Proposed Action and Alternatives 1 and 2), and 1 acre each of permanent and temporary disturbance for one-HML deployment (Alternative 3). It was also assumed that improvements would be made to some road segments within the T/E route network. For this analysis, these road improvements were considered to involve up to 3 feet of permanent disturbance and 20 feet of temporary disturbance along one side of the road or the other.

Within the Proposed Action, two housing options are under consideration which would affect the area of disturbance. If Housing Option H1 is selected, the total surface disturbance at Malmstrom AFB for the Proposed Action would be reduced by 165 acres. If Housing Option H2 is selected, the total disturbance at Malmstrom AFB caused by the Proposed Action would be reduced by 330 acres. If either housing option is selected, additional disturbance would occur in the Great Falls community.

1.6 Decommissioning

It is difficult to predict how the Small ICBM system will be decommissioned. The relevant laws and procedures are likely to change substantially in the 20 or more years the system is in use. The Air Force will follow all relevant laws at the time of decommissioning, whatever they may be. The practice in the recently completed Titan decommissioning program was to remove the missiles from the silos and place them in storage for use as space boosters. It is possible that the same will be done for the Small ICBM. If they are not used in this manner, the missile fuel may be burned off or otherwise disposed. The warheads may be removed and reused or returned to the Department of Energy for reclamation. The details of this process are presently classified.

Facilities on the missile sites will be dismantled and the ground regraded and replanted. If the Minuteman silo is also removed at the same time, the headworks will be dismantled and the silo filled in with earth and replanted. The fences and other equipment will be removed. Legislation presently pending in Congress and supported by the Air Force will provide for the Air Force to return the site to the surrounding landowner if the highest and best use of the property is agricultural. None of these actions is likely to have any significant environmental impact, so far as can be foreseen today. Other disposal alternatives may be developed in the future, but none are foreseen at the present.

1.7 Public Scoping Process

The CEQ regulations for implementation of NEPA require "an early and open process for determining the scope of issues related to the Proposed Action. This process shall be termed scoping..." The purposes of scoping are to identify the significant issues for study in the EIS, and to determine the scope of the research for each issue.

1.7.1 Overview of the Scoping Process

Scoping activities were undertaken in response to these federal requirements as part of the assessment of environmental impacts of major federal actions. The scoping process involved a series of activities that include:

- A prescoping effort to collect preliminary data and information from federal, state, and local government organizations in the affected area;

- A series of scoping meetings with the public and governmental organizations in the affected area; and

- Analysis and documentation of scoping results.

Public scoping meetings were conducted in Great Falls, Lewistown, Conrad, and Helena, Montana in March and April of 1987.

1.7.2 Summary of Scoping Issues

A wide range of issues related to the physical and social environment which included safety concerns were identified through the scoping process. In addition, several other issues, such as arms control, were raised which are not within the scope of this investigation.

Major social issues raised at the scoping meetings included program effects on employment, housing, education, public services, transportation, cultural resources, and visual resources; major physical science issues included program effects on wildlife, threatened and endangered species, water, air quality, and noise. On the basis of investigations performed for the LEIS, discussions with public agencies, and previous Air Force and contractor experience on programs of similar scope, all important issue areas were grouped into 12 resource categories and presented at the scoping meetings. The comments and questions raised throughout the scoping process suggest that the important issues can be addressed through investigations in these 12 resource areas. The environmental consequences of the program are grouped into these resource areas and discussed in Chapter 4.0.

Other issues raised at the scoping meetings related to safety concerns over program operations. Safety concerns were primarily related to the possibility of accidents or terrorist activities that could occur during HML operations, movement of HMLs for training or maintenance purposes, or transportation of the missiles. Consideration is given to effects that would occur from the release of solid propellants, liquid hydrazine fuels, and nuclear materials. The Air Force has formal safety programs covering all phases of weapon system acquisition and operations. The goals of these programs include design safety, operations safety and security, and contingency plans. Air Force safety programs, possible accident scenarios, and the environmental consequences of such accidents are discussed in Chapter 5.0.

At the scoping meetings, a number of requests were made for an analysis of issues that are outside the scope of the EIS. These included requests to analyze the effects of Small ICBM deployment on present and future arms control agreements. Other comments invited analysis of wartime effects, the morality of building nuclear weapons, and of psychological reactions some local residents may have to Small ICBM deployment. The purpose of an EIS, however, is to analyze changes due to the Proposed Action and its reasonable alternatives, including the No Action Alternative, that could significantly affect the quality of the human environment. It is not the purpose of this EIS to discuss morality, military tactics, or general societal issues. Finally, Congress, in Section 209 (c)(4) of the 1986 DOD Authorization Act, directed the Air Force to analyze the environmental effects of "deployment and peacetime operation."

1.8 Authorizing Actions/Procedures

Certain program facilities and activities will require a variety of authorizing actions; that is, permits, approvals, and consultations. Permits for discharges to air and water and disposal of solid and hazardous waste will be obtained in accordance with applicable federal laws. A list of such authorizing actions and the agencies involved, along with corresponding descriptions of the relevant facilities or activities, is presented in Chapter 6.0.

1.9 Potential Mitigation Measures

Potential mitigation measures are undertaken to minimize the adverse environmental impacts of a given program. For the Small ICBM, efforts will be made to avoid environmentally sensitive areas and thereby eliminate or reduce program impacts. In addition, other mitigative programs may be employed to rehabilitate or restore the affected environment or to reduce or eliminate impacts through preservation procedures or compensation.

Environmental impacts of the Proposed Action and its alternatives may be mitigated by commonly practiced construction methods or by standard Air Force and Army COE procedures. To the extent practical in consideration of operational requirements, schedule, and budget, standard construction practices that help reduce or eliminate environmental impacts are taken into account as part of the program. These assumed construction practices and other assumed mitigation measures are discussed for each resource in Chapter 4.0. The Air Force expects to implement these assumed mitigations. Additionally, potential mitigation measures to further reduce impacts and the agencies involved in their implementation can also be found in Chapter 4.0. Implementation of these potential mitigation measures may be constrained by budget limitations and mission requirements.

2.0 COMPARISON OF THE PROPOSED ACTION AND ALTERNATIVES

This chapter presents a comparison of the impacts of the Proposed Action and housing options, the three system alternatives, and the No Action Alternative. The cumulative impacts of basing the Small Intercontinental Ballistic Missile (ICBM) and the potential Peacekeeper in Rail Garrison programs at Malmstrom Air Force Base (AFB) are also presented.

The environmental consequences of the proposed Small ICBM program at Malmstrom AFB have been evaluated in terms of the magnitude and significance of the impacts. Magnitude is a measure of the numbers and kinds of environmental consequences of the program as compared to existing and future baseline conditions, which include the deployment of the new KC-135R air refueling mission. It is defined by the level of impact (LOI), which can be negligible, low, moderate, or high. Significance requires consideration of both the context and the intensity of impacts. Context includes consideration of whether the setting of an impact is site, local, or regional and whether it is of short or long duration. Intensity refers to the severity of an impact, which includes consideration of its magnitude.

For the proposed Small ICBM program at Malmstrom AFB, site impacts would occur as a result of construction disturbance at the base (including the base expansions for family housing and the Hard Mobile Launcher (HML) vehicle operations training area), at launch facilities, and along the transporter/erector (T/E) route network. Local impacts would occur in the City of Great Falls and other communities where program inmigrants would reside. Regional impacts would occur in basins or airsheds, or county or multiple-county areas from which construction resources would be extracted. The collective effects of site impacts would vary with the launch facilities selected, whereas the collective effects of local and regional impacts generally would not.

The LOI and significance of short- and long-duration effects were evaluated separately. Short-duration impacts are transitory effects of the proposed program that are generally caused by construction activities or operation start-up. Long-duration impacts would occur over an extended period or time, whether they start during the construction or operations phases. Most impacts from the operations phase are expected to be of long duration since program operations essentially represent a "steady-state" condition (i.e., impacts result from actions that occur repeatedly over a long period of time). However, long-duration impacts can also be caused by construction activities if a resource is destroyed or irreparably damaged, or if the recovery rate of the resource is low.

An overall collective summary of LOI and significance was prepared for each resource element. In preparing these assessments, the collective effects of all individual site or local impacts have been considered for the program as a whole. It is possible to identify high impacts at some sites and have an overall regional assessment of low or moderate LOI. For the Proposed Action and Alternatives 1 and 2, not all launch facilities would be used; therefore, it is possible to have an overall range of LOI which would depend on the site impacts at launch facilities selected for Small ICBM deployment.

Figure 2.0-1 presents a summary of the collective LOI and significance of local and regional impacts for the Small ICBM program. Both short- and long-duration impacts for the Proposed Action and its alternatives are shown. Figure 2.0-2 provides a summary of the LOI and significance of site impacts at launch facilities. The assessments of site impacts are based on the Proposed Action, which would locate two HMLs at each selected launch facility in earth-covered igloos. The conclusions are generally valid for

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible	☐	
Low	∘	•
Moderate	○	●
High	◯	⬤
Beneficial Effects	▒	

Note: Some resource elements may have both beneficial effects and adverse impacts.

	PROGRAM IMPACTS											
	SHORT DURATION						LONG DURATION					
	PROPOSED ACTION						PROPOSED ACTION					
	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
SOCIOECONOMICS												
ECONOMIC BASE	▒○	▒○	▒○	▒○	▒○	▒○	▒○	▒○	▒○	▒○	▒○	▒○
DEMOGRAPHICS							●	●	●	●	⬤	●
HOUSING	▒	▒	▒	▒	▒	▒	▒○	▒⬤	▒⬤	▒○	▒○	▒○
EDUCATION							⬤	⬤	⬤	⬤	⬤	⬤
PUBLIC SERVICES (SEE NOTE BELOW)	○	○	○	○	○	○	●	●	●	•	⬤	●
PUBLIC FINANCE							●	●	▒●	●	●	●
UTILITIES												
POTABLE WATER							∘	∘	∘	∘	∘	∘
WASTEWATER							∘	∘	∘	∘	∘	∘
SOLID WASTE							∘	∘	∘	∘	∘	∘
ENERGY	∘	∘	∘	∘	∘	∘	▒∘	▒∘	▒∘	▒∘	▒∘	▒∘
TRANSPORTATION												
ROADS	⬤	⬤	⬤	⬤	⬤	⬤	▒∘	▒⬤	▒⬤	▒∘	▒●	▒∘
PUBLIC TRANSPORTATION												
RAILROADS												
AIRPORTS												
LAND USE												
URBAN							∘	∘	○	∘	∘	∘
RECREATION												
REGIONAL							∘	∘	∘	∘	∘	∘
LOCAL							●	●	●	●	●	●
WATER RESOURCES												
WATER USE	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘
SURFACE WATER	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘	∘
GROUNDWATER	∘	∘	∘	∘	∘	∘						
GEOLOGY AND SOILS												
AGGREGATE RESOURCES	⬤	⬤	⬤	⬤	⬤	⬤	○	○	○	○	○	○
AIR QUALITY	∘	∘	∘	∘	∘	∘						
NOISE	○	○	○	○	○	○						

EM2/1

Note: Except for existing overcrowded conditions in the Cascade County jail, public service impacts would not be significant.

FIGURE 2.0-1 COLLECTIVE SUMMARY OF LOCAL AND REGIONAL IMPACTS ASSOCIATED WITH THE PROPOSED SMALL ICBM PROGRAM IN MONTANA

	NUMBER OF LAUNCH FACILITIES													
	SHORT TERM							LONG DURATION						
	NOT SIGNIFICANT				SIGNIFICANT			NOT SIGNIFICANT				SIGNIFICANT		
	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH
LAND USE														
RURAL	48	139	13					41	127	12		17	1	2
VISUAL RESOURCES	179		21					179	20	1				
CULTURAL AND PALEONTOLOGICAL RESOURCES														
PREHISTORIC												61	101	38
HISTORIC AND ARCHITECTURAL								185				10	5	
NATIVE AMERICAN								186				11	2	1
PALEONTOLOGICAL								1	91			6	100	2
BIOLOGICAL RESOURCES AND THREATENED AND ENDANGERED SPECIES														
VEGETATION	106	57			37			106	80			14		
WILDLIFE	125	38	37					124	76					
AQUATIC HABITATS	150	32	4	1	10	1	2	182	13	2		3		
UNIQUE AND SENSITIVE HABITATS	200							200						
THREATENED AND ENDANGERED SPECIES	172	22			5		1	172	22			5		1
WATER RESOURCES														
SURFACE WATER SEDIMENTATION	155	39	3	3				200						
GEOLOGY AND SOILS														
GEOLOGIC HAZARDS	113	77	8	2				113	77	8	2			
ENERGY RESOURCES	200							138	62					
SOIL EROSION	76	81	10	33				200						

Note: All cultural and paleontological resource impacts are assumed to be long duration.

EM2/2

FIGURE 2.0-2 SUMMARY OF SITE IMPACTS ASSOCIATED WITH PROPOSED SMALL ICBM CONSTRUCTION AND OPERATIONS AT LAUNCH FACILITIES IN MONTANA

all alternatives except for rural land use impacts. These impacts depend on the extent of the explosive safety zones which in turn depends on the type of HML shelter (igloo or pre-engineered building) and the number of HMLs (1 or 2) at each launch facility.

If the No Action Alternative is selected, Air Force activities associated with maintenance of the current Minuteman force and other missions will continue indefinitely at Malmstrom AFB. These activities include the new KC-135R air refueling mission, which will be added in 1988.

Employment and population in north-central Montana are projected to increase gradually through the year 2000 without the Proposed Action or alternatives. Most of this growth will be concentrated in Great Falls and Helena, with little growth or modest declines expected in the rural counties. Unemployment rates should decrease to a regional average of 6 percent. The military population (active-duty personnel plus dependents) of the Great Falls area should be at about 10,500 persons, or 15.2 percent of total community population. Some anticipatory growth, followed by decline, is likely if individuals and businesses speculate on the likelihood that the program will be implemented.

Throughout the deployment area, baseline population growth will lead to some increased disturbance of cultural resources and sensitive biological habitats. Water use may increase slightly in the region. Some increased crowding of recreational areas may occur, and the level of service along some roads is expected to decrease.

The Proposed Action and the three system alternatives were selected to represent the range of anticipated environmental impacts that would result from the Small ICBM program at Malmstrom AFB. Comparison of all alternatives with the Proposed Action was performed under the assumption that most of the required new military family housing units would be provided onbase. The amount of new military family housing to be constructed would ultimately be determined by a needs study, and may be limited by budget constraints. Therefore, two additional housing options were analyzed to evaluate the full range of consequences resulting from housing Small ICBM inmigrants within the Great Falls urban area. One option (Housing Option H1) provides for partial military family housing onbase; the other (Housing Option H2) assumes that all housing would be provided by the private sector in the Great Falls urban area.

The housing option selected would determine where many of the operations personnel would reside. This, in turn, would have an influence on the socioeconomic and other consequences of the program. The housing options are discussed throughout the Environmental Impact Statement (EIS) in the context of the Proposed Action. The selection of Alternative 2 with no onbase military family housing would lead to an increase in the demand for housing units in the Great Falls community over that analyzed for the Proposed Action with Housing Option H2. For those resource elements that would experience more pronounced effects under Alternative 2 with no onbase military family housing, the differences are discussed. The affected resources and elements are: socioeconomics (housing, education, public services, and public finance), utilities (water treatment and distribution, and wastewater), and transportation (roads).

Impacts to each resource and resource element associated with the Proposed Action (including housing options) and the three system alternatives are summarized and compared in the following sections. Cumulative impacts of the proposed Small ICBM and the potential Peacekeeper in Rail Garrison programs are also discussed. The Proposed Action, the housing options, and the alternatives are described in Section 1.3 of

Chapter 1.0 (Program Overview). The Peacekeeper in Rail Garrison program is described in Section 1.4.2. The resources and their elements are defined at the beginning of each resource section in Chapter 3.0 (Affected Environment). Chapter 4.0 (Environmental Consequences) presents a complete discussion of program impacts to each resource and resource element.

2.1 Socioeconomics

The socioeconomics resource includes six major elements: economic base, demographics, housing, education, public services, and public finance. Short-duration impacts were considered to be those that are transitory, generally occurring during the construction phase. Most socioeconomic impacts are of long duration, resulting from the steady build up of construction and operations personnel.

2.1.1 Economic Base

For the Proposed Action including all housing options, short-duration impacts for the economic base element are judged to be moderate due to a 30-percent increase in employment in the construction sector in Cascade County in 1990 and 1991. These impacts are judged not significant since the availability of construction labor from other Montana counties should provide an adequate workforce. Beginning in 1995 and continuing for the life of the Small ICBM program, the unemployment rate in Cascade County is projected to increase from 6.0 percent to 6.2 percent since the number of jobs created by the program during operations is less than the number of military dependents added to the labor force. Consequently, the long-duration impact is considered moderate. This is not considered a significant impact since the resulting rate will remain well below historical levels. The creation of additional jobs and income in the construction sector will have short-duration beneficial effects. Increases in local spending for both program procurement and personal consumption will provide beneficial effects through the life of the program.

The short- and long-duration impacts of all three system alternatives are rated the same as the Proposed Action (moderate and not significant). The beneficial effects associated with increased jobs and income would also occur for these alternatives at slightly different levels. Although the impacts are rated the same, Alternative 1 has a lower operations personnel requirement and would actually have less effect on the economic base than the Proposed Action. Alternative 2, with a larger personnel requirement, would have a somewhat greater effect, and the effect of Alternative 3 would be exactly the same.

The possible addition of Peacekeeper in Rail Garrison basing to the Proposed Action at Malmstrom AFB would slightly increase overall labor and materials requirements. However, the cumulative short- and long-duration impacts would remain moderate and not significant.

2.1.2 Demographics

For the Proposed Action including all housing options, measurable impacts for the demographics element were judged to be of long duration only. Impacts will be moderate due to the military population increase in Cascade County from 10,700, which includes the KC-135R air refueling mission, to 18,210. The projected military population would represent approximately 23.6 percent of Great Falls urban area population compared to an historical peak of 20.4 percent in 1972. In addition, new military inmigrants would

differ greatly in demographic characteristics such as average age, marital status, income, and length of residency from the current population in the Great Falls area. This impact is considered significant since the differences between the local and inmigrating populations will complicate the process of community assimilation.

For Alternative 1, long-duration impacts will be moderate and significant in Cascade County because the military population is projected to increase from 10,700 to 16,010. For Alternative 2, long-duration impacts will be high and significant in Cascade County because the military population is projected to increase from 10,700 to 19,810. Impacts for Alternative 3 are identical to the Proposed Action.

The addition of Peacekeeper in Rail Garrison basing to the Proposed Action at Malmstrom AFB is not expected to change the LOI or significance of area demographic effects, which would remain moderate and significant.

2.1.3 Housing

For the Proposed Action with programmed onbase housing, both adverse and beneficial impacts will be experienced. These long-duration impacts are judged to be moderate due to decreased vacancy rates (2.3%) which will approach the historical minimum rate (1.7%). With this lower vacancy rate, renters and buyers in the Great Falls urban area may experience some difficulty in finding appropriate and affordable housing. This impact is considered not significant because it is expected that program-related military families will be suitably housed with only a small number of military households living offbase. Landlords and other property owners will experience both short- and long-duration beneficial effects due to the increased occupancy rates for temporary accommodations during construction and permanent housing units during the life of the program. Under both Housing Options H1 and H2, long-duration impacts for renters and home buyers will likely be high due to vacancy rates which fall below the minimum historical rate. The current housing allowances for the projected officer and enlisted personnel mix average about $340 monthly per household. New private housing would require about $700 per month for units generally considered suitable. This would be out of the range of affordability for Small ICBM military personnel below grade E-4, who receive an average housing allowance of only $265 per month. For Housing Options H1 and H2, impacts are judged significant since it is unlikely that the private housing market can provide new housing units which meet onbase standards at a price that military personnel can afford. The beneficial effects to landlords and other property owners would be greater under these two scenarios due to the even higher occupancy rates.

For Alternative 1, the offbase housing requirement will be reduced by about 18 percent. However, long-duration impacts would remain the same as for the Proposed Action with programmed housing. For Alternative 2 with military family housing provided onbase, long-duration impacts are rated the same as for the Proposed Action with programmed housing (moderate but not significant). With no military family housing onbase, long-duration impacts would be high and significant. Impacts for Alternative 3 will be identical to those of the Proposed Action.

The addition of the proposed Peacekeeper in Rail Garrison basing to the Proposed Action with programmed onbase housing at Malmstrom AFB will cause a slight increase in the demand for permanent offbase housing in Great Falls. The cumulative impacts will remain of long duration. Impacts are likely to be moderate because vacancy rates are projected to approach the historical minimum rate. These impacts are judged not significant since the program-related demand is expected to be offset by new private-sector construction. Short- and long-duration beneficial impacts are projected for landlords and other property owners due to increased occupancy rates.

2.1.4 Education

For the Proposed Action including all housing options, long-duration impacts for the education element are judged to be high due to the projected increase of approximately 1,210 students in the Great Falls Public Schools (GFPS) over the projected baseline enrollment of 13,300 in the year 2000, with elementary enrollment concentration at Loy Elementary School. The projected pupil-to-teacher ratio is higher than the GFPS historical local standard of 23-to-1. These impacts will be significant since the projected number of pupils per classroom are greater than the state maximum standard of 28-to-1. Impacts on all other school systems are considered to be negligible.

For Alternative 1, long-duration impacts are rated the same as for the Proposed Action (high and significant), though school enrollments would be less at a projected increase of 858 students. For Alternative 2, long-duration impacts are also rated high and significant, though school enrollments would be greater at a projected increase of 1,472 students. Impacts for Alternative 3 are identical to those of the Proposed Action.

The addition of Peacekeeper in Rail Garrison basing to the Proposed Action at Malmstrom AFB will cause less than a 1-percent increase in total enrollment for the GFPS. Long-duration cumulative impacts for education will remain high and significant.

2.1.5 Public Services

For the Proposed Action including all housing options, short-duration impacts for the public services element are judged to be moderate and not significant. Increases of about 9 percent in demands for health and emergency services in Cascade County during the construction phase would cause impacts at this level. The overall long-duration impacts to public services, for all housing options, are evaluated to be moderate due to increases in calls for service per officer of up to 10 percent for the Great Falls Police Department and Cascade County Sheriff's Department. These impacts would be significant due to the lack of capacity in the Cascade County jail for which sufficient funds for additional capacity are not available.

For Alternative 1, long-duration impacts are evaluated as low due to increases in calls for service per officer of up to 6 percent for the Cascade County Sheriff's Department and Great Falls Police Department. These impacts are judged to be significant due to additional demands placed on the county jail and the unavailability of funds to alleviate this problem. For Alternative 2, long-duration impacts are evaluated as high due to increases in calls for service per officer greater than 10 percent for the Cascade County Sheriff's Department. These impacts are considered significant due to the overcrowded jail and lack of funding to correct the problem. Impacts for Alternative 3 will be identical to the Proposed Action with programmed housing.

The addition of Peacekeeper in Rail Garrison basing to the Proposed Action at Malmstrom AFB will cause a small increase in the demand for public services. Short-duration cumulative impacts would remain moderate and not significant, and long-duration impacts would be moderate and significant.

2.1.6 Public Finance

For the Proposed Action including all housing options, long-duration impacts to public finance are considered moderate and significant because of persistent revenue shortfalls in Cascade County and the two Great Falls school districts. With programmed housing,

the annual shortfalls in Cascade County will range up to $290,000 over the buildup phase and decrease to about $270,000 annually during the operational years of the Small ICBM program. The peak shortfalls would represent approximately 2.5 percent of the county's baseline budget over these years and would reduce the fund balances of the county to below historical levels by fiscal year (FY) 1995. Without programmed housing, the shortfalls for the elementary and high school districts range up to $550,000 for the elementary district and $320,000 for the high school district (Housing Option H2) and are estimated at $170,000 and $90,000 per year during the operational years of the Small ICBM program. The peak shortfalls would represent approximately 2.3 percent of the elementary district's baseline budget and 2.6 percent of the high school district's budgets. The shortfalls would reduce the fund balances of the districts to below historical levels by FY 1993 for the elementary school district and FY 1995 for the high school district. While overall impacts are judged moderate and significant due to adverse effects to the county and the two school districts, the City of Great Falls is expected to benefit from an increased tax base as more housing is developed offbase.

The impacts to public finance of all three system alternatives will be moderate and significant over the operational years of the program because persistent revenue shortfalls will occur in Cascade County and the two Great Falls school districts. Under Alternative 1, program-induced revenues and expenditures would be approximately one-third less than those estimated under the Proposed Action with programmed housing. Revenue shortfalls would also decrease by similar levels, but not to levels which would change the impact classification. Under Alternative 2 with military family housing onbase, program-induced revenues and expenditures would be approximately 20 percent greater than those estimated under the Proposed Action with programmed housing. If no housing is provided onbase, the revenues and expenditures would be about 23 percent greater than those estimated under the Proposed Action with Housing Option H2. Revenue shortfalls would also increase by similar levels, but not to levels which would change the impact classification. Impacts under Alternative 3 would be the same as under the Proposed Action with programmed housing.

The addition of Peacekeeper in Rail Garrison basing will slightly increase both expenditures and revenues for Cascade County, the City of Great Falls, and the two Great Falls school districts. Long-duration cumulative impacts will remain moderate and significant due to adverse effects on Cascade County and the Great Falls school districts.

2.2 Utilities

Utilities analyzed in this EIS include potable water treatment and distribution, wastewater, solid waste, and energy utilities. Energy utilities include electricity, natural gas, and liquid fuels. Some long-duration impacts are expected in the Great Falls urban area. No impacts of strictly short duration are anticipated in Great Falls except for energy utilities. All short-duration impacts on Lewistown and Conrad utility systems are considered negligible.

2.2.1 Potable Water Treatment and Distribution, Wastewater, and Solid Waste

Long-duration impacts to the potable water and wastewater treatment and distribution and solid waste systems in Great Falls will be low and not significant for all housing options under the Proposed Action, and for all three Small ICBM system alternatives. Existing treatment and disposal facilities will be able to service new demands without any additional cost or deterioration in the level of service. Short-duration, negligible

impacts to potable water, wastewater, and solid waste systems in Lewistown and Conrad are expected because of increases of less than 2 percent in demands during the construction phase.

When considering the cumulative impacts of the Peacekeeper in Rail Garrison program and the Proposed Action, the impacts are rated the same: low and not significant. Cumulative impacts will be slightly greater than the Proposed Action; however, adequate capacity is available to meet the increased demands.

2.2.2 Energy Utilities

For the Proposed Action, including all housing options, short-and long-duration impacts to energy utilities will be low and not significant. Short-duration impacts are due to the increase in diesel use during program construction. The impact will not be significant, since the increase represents only a 0.5-percent increase to the state's total diesel use. Short-duration impacts to all other energy systems will be negligible. Long-duration impacts are due to increased loads to rural electric cooperatives serving the missile launch facilities. Impacts on natural gas are considered to be beneficial because Great Falls Gas Company will be able to recover a portion of the sales it anticipated to when the coal-fired central heat plant was installed at Malmstrom AFB.

Alternative 1 impacts will be the same as those for the Proposed Action. Alternative 2 impacts are rated the same as those for the Proposed Action, though overall energy requirements will be slightly increased. Alternative 3 impacts are rated the same as those for the Proposed Action, though requirements for electricity and liquid fuels will be slightly increased.

The cumulative impacts of the Peacekeeper in Rail Garrison program and the Proposed Action are rated the same as those for the Proposed Action alone, though the overall energy requirements will be slightly increased.

2.3 Transportation

The transportation resource includes four elements: roads, public transportation, railroads, and commercial airports. Short-duration impacts to transportation were considered to be those occurring during the construction phase. Long-duration impacts were considered to be those that continue throughout the life of the program, beginning in either the construction or the operations phase.

2.3.1 Roads

For the Proposed Action, short-duration impacts on roads in Great Falls are judged to be high and significant for all housing options due to increased congestion and delay including the further aggravation of service levels along roads already providing degraded service. Long-duration impacts on urban roads in Great Falls would remain high and significant for Housing Options H1 and H2 but would be negligible for the Proposed Action with programmed housing because only a few operations personnel would reside in the community. Both short- and long-duration impacts on roads in Lewistown and Conrad are judged to be negligible. Short- and long-duration impacts on deployment area roads are considered low and not significant because projected baseline traffic volume is low and the LOS would not be reduced below minimum desirable standards. Overall, the short-duration impact on roads would be high and significant for all housing options. Long-duration impacts are the same as for Housing Options H1 and H2. For the Proposed

Action with programmed housing, long-duration impacts are considered to be low and not significant. The improvement of road sections and bridges and the increased level of maintenance work needed to accommodate the HML and its support vehicles are considered to have a long-duration beneficial effect in the region.

For Alternatives 1, 2, and 3, short-duration impacts on roads in Great Falls would remain high and significant, though program-generated traffic for Alternative 1 would be somewhat smaller than that of the Proposed Action. Long-duration impacts on urban roads in Great Falls are judged to be negligible for Alternatives 1 and 3, but are considered moderate and significant for Alternative 2 with military family housing onbase because program-generated traffic would be somewhat greater than that of the Proposed Action with programmed housing onbase. If no housing is provided onbase under this alternative, the long-duration impacts on urban streets in Great Falls would be similar to the Proposed Action with Housing Option H2 (high and significant). Both short- and long-duration impacts on roads in Lewistown and Conrad would remain negligible. Impacts on deployment area roads for all alternatives are judged to remain the same as for the Proposed Action. Overall short-duration impacts on roads would be high and significant for all alternatives. Overall long-duration impacts on roads would be low and not significant for Alternatives 1 and 3 but moderate and significant for Alternative 2. Beneficial long-duration effects will occur because of road and bridge improvements and increased road maintenance.

The cumulative short-duration impacts of concurrent basing of the Proposed Action with Peacekeeper in Rail Garrison are also judged to be high and significant. Long-duration impacts would be moderate and significant for roads in Great Falls because of the additional program-generated traffic induced by Peacekeeper in Rail Garrison personnel. Both short- and long-duration impacts on roads in Lewistown and Conrad and on deployment area roads would remain the same as those of the Proposed Action. The overall short-duration impacts on roads would be high and significant; long-duration impacts would be moderate and significant.

2.3.2 Public Transportation, Railroads, and Airports

For the Proposed Action including all housing options and the three alternatives, both short- and long-duration impacts on public transportation, railroads, and airports are all judged to be negligible. The bus and taxi service in Great Falls, railroads, and area airports are expected to absorb any additional program-induced demand with no schedule modifications, additional personnel, terminal or control facilities, or rolling stock required.

The cumulative effects of concurrent deployment of the Proposed Action with Peacekeeper in Rail Garrison are also judged to be negligible for public transportation, railroads, and airports, though program-generated demand would be somewhat greater than that of the Proposed Action. If Malmstrom AFB is selected as a Rail Garrison location, a separate EIS will be prepared and impacts on railroads would be considered specifically.

2.4 Land Use

The land use resource includes two elements: urban land use and rural land use. The analysis of urban land use focused on the cities of Great Falls, Lewistown, and Conrad. The rural land use analysis considered land uses immediately adjacent to launch facilities and inhabited structures within the explosive safety zones of the launch facilities.

Program impacts that cause permanent changes in urban land use patterns are considered of long duration; impacts of strictly short duration are not expected.

2.4.1 Urban Land Use

For the Proposed Action, long-duration urban land use impacts are rated as low and not significant since approximately 83 acres of a total of 3,185 acres of vacant developable land designated as residential have the potential to be developed by the private sector in the Great Falls urban area. Housing Option H1 may lead to the private-sector development of about 230 acres of vacant developable land; however, the impacts would remain low and not significant. For Housing Option H2, the proposed program is anticipated to result in the private-sector development of approximately 375 acres of vacant developable land. As a result, impacts of Housing Option H2 are rated as moderate and not significant.

For Alternative 1, the long-duration impacts are rated the same as for the Proposed Action with programmed housing (low and not significant), though vacant developable land requirements would be reduced by 11 acres. For Alternative 2, it is estimated that 93 acres, or an increase of 10 acres from the Proposed Action, would be devoted to the development of presently vacant developable land. The impacts would, however, remain low and not significant. Impacts for Alternative 3 are identical to the Proposed Action including a potential for private-sector development of 83 acres of vacant developable land.

The cumulative impacts of the Proposed Action and Peacekeeper in Rail Garrison program would remain low and not significant because the additional housing required by the Peacekeeper in Rail Garrison program would be small. The two programs combined would require a total of 93 acres out of 3,185 acres of vacant developable land designated for residential purposes.

2.4.2 Rural Land Use

For the Proposed Action, long-duration rural land use impacts could range from negligible to moderate and significant depending on which launch facilities are used for the Small ICBM program. New safety easements would be purchased to accommodate expanded explosive safety zones (1,250 ft from HML shelters as compared to 1,200 ft from the existing Minuteman silo). Residential or other occupied structures falling in the expanded zone would have to be acquired by the Air Force, unless the requirement is waived at the owner's request. Negligible impacts would occur if all 100 launch facilities were selected in areas where only rangeland or dry-farmed cropland would be utilized and no inhabited structures are present in the new safety easements. At 180 of the 200 launch facilities, there are no inhabited structures in the new safety easements. The remaining 20 launch facilities contain 43 inhabited structures; 12 of which contain 1 structure (including a school), 7 contain 2 to 6 structures, and 1 contains 12 structures within the 1,250-foot explosive safety zone. If the 20 launch facilities with occupied structures in the 1,250-foot explosive safety zone are chosen, the overall long-duration impacts would be moderate and significant. The short-duration impacts are expected to be low and not significant since 140 acres disturbed from construction activities can return to past uses. Beneficial long-duration effects of the program would occur for rural land use as a result of road improvements.

For Alternatives 1 and 2, as in the Proposed Action, the LOI and significance ratings depend on which launch facilities are used. With Alternative 1, the Air Force plans to

use a pre-engineered building to shelter the HMLs, which would result in an explosive safety zone of 1,795 feet from the shelters, requiring new easements that are larger than for the Proposed Action. As a consequence of this expansion beyond that of the Proposed Action, inhabited structures would fall within the new safety easements at 40 launch facilities. In the optimal case, where 100 launch facilities of the 200 are chosen in uninhabited areas, the impacts would still be negligible. However, if all 40 launch facilities of the 200 containing 93 inhabited structures in the larger 1,795-foot explosive safety zones are used, the impacts would be rated high and significant. Of these 40 launch facilities, 23 have 1 inhabited structure in the expanded zone, 13 have 2 to 4 structures (including a school), 3 have 5 to 9 structures, and 1 has 7 structures in the expanded zone. For Alternative 2, the range of impacts are the same as for the Proposed Action (negligible to moderate and significant), the only difference being the addition of 25 more launch facilities. For Alternative 3, the proposed program would include all 200 launch facilities, with one HML sheltered at each facility in a pre-engineered building. The expanded safety zone for this alternative would be 1,425 feet from the HML shelter, and inhabited structures would be affected at 28 launch facilities; the other 172 launch facilities are in uninhabited areas. With 28 launch facilities containing inhabited structures in the 1,425-foot safety zone, the impacts are rated high and significant. Sixteen of the launch facilities have 1 inhabited structure in the 1,425-foot safety zone (including a school), 9 sites have 2 to 4 structures, 2 sites have 5 or 6 structures, and 1 site has 12 structures.

There will be no additional cumulative impacts to rural land use resulting from the Peacekeeper in Rail Garrison program due to construction occurring only on the base. All projected impacts are addressed in the urban land use element.

2.5 Recreation

The recreation resource consists of regional and local recreation. Long-duration impacts would result from the increase in program personnel throughout the construction phase, reaching a steady-state during the operations phase. Impacts of strictly short duration are not expected.

2.5.1 Regional Recreation

Long-duration impacts to regional recreation for the Proposed Action, regardless of the housing option selected, would be low and not significant. Impacts would be low because overall use at most recreation areas within about 150 miles of Great Falls is generally high only during peak-use periods (e.g., holiday and seasonal weekends). Program-induced use by the inmigrant population would contribute to the crowding of some recreation areas during these periods, resulting in a slight decline in the quality of the recreational experience.

For Alternative 1, program-induced recreation use would be less than for the Proposed Action (program-related inmigration will be approximately 30% lower), but impacts to regional recreation would remain low and not significant because program-induced use would contribute to the crowding of some recreation areas during peak-use periods. However, the smaller increase in use may reduce the potential for a decline in the quality of the recreational experience. Program-induced use would be greater for Alternative 2 than for the Proposed Action (program-related inmigration will be approximately 18% higher); however, impacts would remain low and not significant. For Alternative 3, program-induced recreation use would be similar to that of the Proposed Action; therefore, the impacts would be the same.

If both the Peacekeeper in Rail Garrison program and the Proposed Action are implemented concurrently, the cumulative increase in use would be slightly greater than for the Proposed Action alone (program-related inmigration would be approximately 9% higher), but impacts would remain low and not significant.

2.5.2 Local Recreation

Long-duration impacts to local recreation for the Proposed Action would be moderate and significant regardless of the housing option selected, because program-induced population growth in Great Falls would result in facility shortages (particularly for softball and golf) and potential parkland deficiencies in the local recreation system. If either Housing Option H1 or H2 is selected, development of additional parkland may be required depending on the location of new housing in the community. Impacts would be significant because the development of additional facilities and parkland may require an extensive institutional response in the form of capital expenditures. The facility shortages would occur even without the program but would be exacerbated with the program-induced population increases resulting in a noticeable decline in the level of service unless additional facilities are provided.

For Alternative 1, though program-induced inmigration would be lower than for the Proposed Action, impacts to local recreation would remain moderate and significant because facility shortages would still occur. Program-induced growth for Alternative 2 would be higher than for the Proposed Action, but impacts would remain moderate and significant. Program-induced population growth for Alternative 3 would be similar to that of the Proposed Action; therefore, the impacts would be the same.

If both the Peacekeeper in Rail Garrison program and the Proposed Action are implemented concurrently, the cumulative growth in population would be higher than for the Proposed Action alone, but impacts would remain moderate and significant.

2.6 Visual Resources

The overall impact of the Proposed Action on visual resources would be negligible. Of the 200 launch facilities in the deployment area, only 21 are within 0.5 mile of and visible from scenic or heavily traveled highways (highways with a 1985 average annual daily traffic of at least 1,000). Construction of earth-covered igloos would have a short-duration moderate and not significant impact on 21 launch facilities and long-duration moderate and not significant site impact on visual resources at only one of the 21 launch facilities (A-6 near Monarch), with low and not significant site impacts at the other 20. These impacts are the result of the contrasts among form, line, color, and texture that would occur because of earth-covered igloo construction. The remaining 179 launch facilities are categorized as infrequently seen, except from some local residences, and would therefore have negligible impacts. (Approximately 93 occupied residences are located between 1,200 ft and 2,000 ft of 46 existing launch facilities). It is possible that none of the 21 launch facilities would be used for Small ICBM deployment; however, even if all 21 launch facilities with low to moderate impacts are used, the overall impact of the Proposed Action on visual resources would be negligible.

The overall impacts of Alternatives 1, 2, and 3 would also be negligible. It was assumed, for analysis of each of these alternatives, that all 21 of the launch facilities visible from scenic and heavily traveled highways would be used for either earth-covered igloos (Alternative 2) or pre-engineered buildings (Alternatives 1 and 3). Short-duration

impacts of all alternatives would be similar to those of the Proposed Action. Long-duration impacts for Alternative 2 would be similar to the Proposed Action. However; for Alternatives 1 and 3, 1 launch facility (A-6) would have a high impact while all others would have negligible impacts.

Because of their low profile and distance from U.S. 87/89, which is located along the south side of the base, visual impacts of program facilities at Malmstrom AFB would also be negligible for the Proposed Action as well as each of the three alternatives. Likewise, visual impacts related to road improvements would be negligible.

The cumulative impacts on visual resources of possible Peacekeeper in Rail Garrison basing and the Proposed Action would remain negligible because the earth-covered train shelters would not be noticeable to viewers on U.S. 87/89. The intervening topography would hide facilities from most locations along the highway.

2.7 Cultural and Paleontological Resources

Cultural and paleontological resources include four elements: prehistoric resources, historic and architectural resources, Native American resources, and paleontological resources. Impacts to these resources would occur mainly as a result of ground disturbance associated with construction activities such as expansion of the base and launch facilities and road and bridge improvements. Impacts resulting from ground disturbance are considered to be of long duration because they cause irreversible changes to nonrenewable resources. Native American resources can also be affected by temporary changes in the accessibility of sacred sites and traditional use areas.

2.7.1 Prehistoric Resources

Overall impacts of the Proposed Action including all housing options are estimated to be low because most impacts would occur in areas expected to contain few important sites. However, site impacts at individual launch facilities may range from low to high. Impacts would be significant because some affected sites are likely to have the potential to yield important scientific information. The most sensitive areas are along drainages where road and bridge construction is most likely to affect intact buried deposits. The data synthesis and analyses undertaken during generation of the predictive model used to program baseline conditions are considered to be beneficial to the archaeological community.

For Alternative 1, fewer acres would be required for housing expansion, slightly reducing the likely program effects at Malmstrom AFB. All other impacts are anticipated to be the same as for the Proposed Action and the LOI and significance ratings would not change. Alternative 2 involves an increase in the acreage required for housing expansion and the use of 125 launch facilities rather than 100. As a result, it would be more difficult to avoid sensitive resource zones and impacts are likely to be slightly higher than those of the Proposed Action. However, overall impacts are still expected to be low and significant. Alternative 3 would have the highest site-level impacts because all 200 launch facilities would be used and no locations in sensitive areas would be avoided. However, only 19 percent of the launch facilities occur in high sensitivity resource zones, and overall impacts would still be low and significant.

If deployment of the Peacekeeper in Rail Garrison program is concurrent with the Proposed Action, only a slight increase in the housing expansion acreage would be required. Because of the limited expansion of the disturbed area, no other increases in impacts are anticipated, and impacts would be the same as for the Proposed Action.

2.7.2 Historic and Architectural Resources

For the Proposed Action including all housing options, impacts would be low because few resources are expected to occur in program impact areas. Most impacts would occur along deployment area roads, where historic bridges are upgraded or where vacant structures will experience indirect effects. Impacts are considered significant because some of these types of sites are expected to be eligible for the National Register of Historic Places.

Impacts for Alternative 1 are identical to those projected for the Proposed Action. For Alternative 2, impacts would be slightly higher than for the Proposed Action because more launch facilities would be used and more acres would be necessary for housing expansion. However, impacts are still rated as low and significant. Impacts for Alternative 3 would be higher than for the Proposed Action or other alternatives but would still be low and significant because few resources are likely to be affected in relation to the regional resource base.

Cumulative impacts resulting from the concurrent deployment of the Peacekeeper in Rail Garrison and Small ICBM programs are not expected to increase perceptibly over impacts identified for the Proposed Action. Additional impacts would occur only at Malmstrom AFB where few historic resources are expected to occur.

2.7.3 Native American Resources

Impacts of the Proposed Action including all housing options are judged to be low because most known and projected sacred and traditional use areas occur near drainages or on high prominences and would not be subject to program effects. Impacts that do occur would be significant because they would disturb sacred areas important to Native Americans. Three launch facilities occur in sensitive areas and additional sites may be identified as a result of ongoing consultations with affected tribal groups.

For Alternative 1, impacts would be the same as for the Proposed Action. Impacts for Alternative 2 are expected to be slightly higher than for the Proposed Action because the use of more launch facilities reduces the chance that sensitive areas would be avoided. However, overall impacts would still be low and significant. For Alternative 3, impacts would be higher than for the Proposed Action or any of the other alternatives. Because all launch facilities would be used, the sensitive areas near launch facilities D-9, F-9, and T-41 would be affected. No surface disturbances are expected to occur in these areas; however, impacts are still judged to be moderate and significant in recognition of the possibility that activities in close proximity to the physical locations of burials may affect additional burials or may constitute visual or auditory intrusions to the sensitive areas.

The cumulative effects of the concurrent deployment of the Peacekeeper in Rail Garrison and Small ICBM programs would not cause any additional impacts to Native American resources. Additional impacts would occur only at Malmstrom AFB and the effects would be the same as for the Proposed Action.

2.7.4 Paleontological Resources

Impacts resulting from the Proposed Action are predicted to be moderate because most impacts would occur on geologic units in which fossil localities are widely dispersed. Internationally important paleontological localities with dense concentrations of well-preserved fossils are located in only 1 percent of the impact area. Most impacts would occur on formations in which similar fossils may be found; however, specimens are dispersed within the formation and may or may not be encountered during program activities. Impacts would be significant because the research potential of fossil materials important to the scientific community would be reduced.

For Alternatives 1 and 2, impacts would be identical to those identified for the Proposed Action. Impacts for Alternative 3 are still rated moderate and significant, though impacts would be slightly higher because two high-sensitivity areas would not be avoided.

If Peacekeeper in Rail Garrison is based concurrently with the Proposed Action, the cumulative impacts to paleontological resources would not increase. Additional impacts would occur only at Malmstrom AFB, an area of low paleontological sensitivity.

2.8 Biological Resources and Threatened and Endangered Species

Biological resources and threatened and endangered species include five elements: vegetation, wildlife, aquatic habitats, unique and sensitive habitats, and threatened and endangered species. Short-duration impacts to biological resources were considered to be those occurring during the construction phase and recovering within several seasons. Long-duration impacts were considered to be those possibly extending throughout or beyond the life of the program, beginning in either the construction or the operations phase. For the Proposed Action, disturbance of land onbase for the housing and HML vehicle operation training area options have been considered. However, the lands planned for these uses support active agricultural practices making them marginal natural habitat. Program use of these lands would not severely affect biological resources nor would effects differ by quantities of land disturbed; therefore, these options were not discussed independently under the element summaries that follow. Other currently undeveloped parcels of land on Malmstrom AFB also represent only marginal biological habitat. Disturbance of these lands is not expected to substantially affect any elements of biological resources and threatened and endangered species. All alternatives are expected to use the entire T/E route system; therefore, there would be no differences in impacts among the alternatives because of road and bridge upgrades.

2.8.1 Vegetation

Short- and long-duration impacts to vegetation from the Proposed Action, including direct mortality of plants, loss of plant cover, crushing of plants, soil compaction, and some soil erosion, would be low and not significant because much of the area has been previously disturbed and only a small amount of native vegetation in the deployment area would be disturbed overall. On a site-level basis, 37 launch facilities would have short-duration, low, and significant impacts; 57 would have short-duration, low, and not significant impacts; and 106 would have negligible impacts, depending on their proximity to high-value native vegetation communities and their potential for revegetation. A generally low quantity of disturbance is expected at each facility. Disturbances at 14 launch facilities would have long-duration, low, and significant impacts because they are located near forest or woody riparian community types that are slow to recover from disturbance. Long-duration impacts at the remaining 186 launch facilities are rated as

either negligible or low and not significant for the same reasons previously described and because vegetation disturbance during operations is expected to be minimal. The potential disturbance by HML training operations to onbase vegetation is substantial, but most of the training would occur on already disturbed lands. Impacts as a result of off-road HML operations include soil compaction, crushing of plants, and plant mortality where repeated passes occur or where substantial soil moisture is present. Site impacts at launch facilities including loss of plants and plant habitat would remain low even if the most sensitive areas are disturbed, and would not change due to impacts along T/E routes and onbase.

Alternative 1 would result in essentially the same disturbance as the Proposed Action. Alternatives 2 and 3 would result in an accumulation of additional site-level disturbances of 75 acres and 100 acres of vegetation at launch facilities, respectively, but even these disturbances would not change the LOI or significance ratings from low and not significant for vegetation.

The cumulative disturbance of vegetation resulting from the concurrent deployment of the Peacekeeper in Rail Garrison program and the Small ICBM at Malmstrom AFB is rated the same as that for the Proposed Action alone (low and not significant), because the amount of vegetation removed by facilities will be small and much of the native vegetation has been replaced by introduced species.

2.8.2 Wildlife

The Proposed Action would affect some wildlife habitat, but would not affect the overall capacity of the habitat to support wildlife in the deployment area or disturb any specific wildlife populations. There are 75 launch facilities where short-duration impacts (e.g., behavioral disruption and displacement) may range from low to moderate (the remaining 125 rate as negligible) depending on proximity to big game wintering habitat; however, these are rated as not significant because of the temporary nature of the impacts, the small amounts of habitat involved, and its marginal value due to existing habitat disturbance. At 76 launch facilities, long-duration, site-level impacts would be low due to the minor traffic levels and the low degree of human activity and noise at the sites. These impacts would not be significant because disruption of the animals' behavior and displacement would be temporary due to the wildlife species adaptability to operations activities. Although impacts to wildlife at launch facilities may range from negligible to moderate depending upon which launch facilities are selected, with the addition of onbase and T/E route surface disturbance, the overall short and long-duration impacts to wildlife would be low and not significant for these actions.

Alternatives 1 and 2 would result in disturbances similar to those of the Proposed Action. Short- and long-duration impacts for these alternatives would be low and not significant. Alternative 3 may result in some local impacts to wildlife during construction because all launch facilities (including 76 launch facilities in sensitive wildlife habitat) would be used. This additional disturbance by daily activities would result in short-duration, moderate and long-duration, low impacts that would not be significant.

Additional impacts to wildlife habitat on Malmstrom AFB that would result from concurrent deployment of the Peacekeeper in Rail Garrison and Small ICBM programs would be negligible.

2.8.3 Aquatic Habitats

The Proposed Action would result in accumulated impacts onbase, along T/E routes (especially at bridge upgrades), and at launch facilities that may affect fisheries and wetlands. These overall short-duration impacts would be moderate due to temporary disturbance from equipment, debris, and in-stream structures, and sedimentation in stream and wetland habitats causing fish mortality and degradation of habitat during construction. Overall long-duration impacts would be low because of limited landfill encroachments or operations effects at aquatic habitats near launch facilities. These impacts would not be significant because construction is expected to be in compliance with the Montana Stream Protection Act and the Montana Streambed and Landform Preservation Act. Selection of launch facilities is not expected to change this overall rating because the variation in site impacts at launch facilities is low. The greatest potential for short-duration site impacts to aquatic habitats at launch facilities would result from construction (including landfill, sedimentation, and direct physical disturbance). Thirteen sites have the potential for short-duration site impacts that would be significant due to the high wetland and fisheries value of the particular habitats potentially disturbed. Long-duration site impacts to aquatic habitats at launch facilities are less intensive than are short-duration site impacts, with 182 rated as negligible, 13 low, and 2 moderate and not significant, and only 3 rated as low and significant (due to their high habitat values).

Impacts from Alternatives 1 and 2 would be almost identical to those of the Proposed Action, differing only in the accumulation of impacts at 25 additional launch facilities for Alternative 2. These additional 25 site impacts would not add substantially to the accumulated impacts. Alternative 3 would result in some severe site impacts to aquatic habitats because none of the launch facilities would be avoided; however, these accumulated impacts would not be substantially greater than accumulated impacts for the other alternatives. Short-duration impacts would be moderate and long-duration impacts would be low for all alternatives. These impacts to aquatic habitats would not be significant.

Concurrent deployment of the Peacekeeper in Rail Garrison and Small ICBM programs at Malmstrom AFB would result in only minor additional sedimentation disturbance to aquatic habitats (Missouri River) and cumulative impacts would be negligible.

2.8.4 Unique and Sensitive Habitats

No unique and sensitive habitats would be directly affected by the Proposed Action or alternatives; therefore, impacts to unique and sensitive habitats would be negligible for all actions. Cumulative impacts from concurrent basing of the Peacekeeper in Rail Garrison and Small ICBM programs at Malmstrom AFB would not disturb any unique and sensitive habitats.

2.8.5 Threatened and Endangered Species

Federally listed and Montana-recognized threatened and endangered species occur near some of the launch facilities and T/E route segments. There are no federally listed plants but there are five federally listed animal species in the program area. Because of the distributions of these animals, it is unlikely that they would be disturbed by the program. Montana-recognized plant species and their habitat types occur near some of the launch facilities and roads. Short and long-duration impacts from construction at one launch facility would be high due to the known presence and proximity of one sensitive

plant species. Construction at this site would result in direct mortality of individuals of the species and loss of habitat. Other sensitive plant habitat potentially occurs near five launch facilities and may receive short- and long-duration, low impacts, such as plant mortality and loss of habitat. These impacts would be significant because they are Montana-recognized plant species. All other similar short- and long-duration impacts (172 negligible and 22 low) at the remaining facilities would not be significant because of the small number of sensitive species occurring in the area of direct surface disturbance. Overall short- and long-duration impacts to threatened and endangered species would be low and not significant.

Alternatives 1 and 2 would result in approximately the same level of disturbance to sensitive species as the Proposed Action and overall impacts would be the same. Alternative 3 would not avoid those launch facilities associated with habitat for sensitive species, but overall, these disturbances are unlikely to produce large impacts. On an overall basis, short- and long-duration impacts would be moderate and not significant for Alternative 3.

The concurrent deployment of the Peacekeeper in Rail Garrison and the Small ICBM programs at Malmstrom AFB would result in no additional cumulative impacts to threatened and endangered species.

2.9 Water Resources

Water resources includes three elements: water use, surface water hydrology and quality, and groundwater hydrology and quality. Surface and groundwater resources would receive site impacts associated with road and bridge improvements and launch facility modification. All these elements would receive local impacts due to program-related water supply requirements.

2.9.1 Water Use

Under the Proposed Action, water use, including direct program construction water and indirect domestic use by program inmigrants, would amount to about 4,900 acre-feet (acre-ft) during the construction phase. Program-related water use during the operations phase would be about 1,500 acre-feet per year (acre-ft/yr). Water use is not substantially changed by any of the housing options. Most of the construction phase water and virtually all of the operations phase water would be obtained from the Great Falls supply. The water sources available to the affected towns, Great Falls, Conrad, and Lewistown, and to Malmstrom AFB, are all adequate to meet program needs. Only relatively small amounts of program water (470 acre-ft over the 6-yr construction phase) would be needed in the rural portions of the deployment area and its diversion for program use would generally have minimal impacts upon existing users. Therefore, the overall short- and long-duration impacts to water use would be low and not significant.

For the alternatives, construction-phase water use would vary from 4,000 acre-ft for Alternative 1 to 5,000 acre-ft for Alternative 2. Operations water use would vary from 1,040 acre-ft/yr for Alternative 1 to 1,780 acre-ft/yr for Alternative 2. Water use in Conrad and Lewistown and in the rural portions of the deployment area would remain substantially the same as that of the Proposed Action. The water supply available to Great Falls and the base can readily meet the somewhat higher water demands of Alternative 2. The water use impacts for all alternatives are therefore the same as for the Proposed Action.

Construction of the Peacekeeper in Rail Garrison program would result in an additional 520 acre-ft of water use during the construction phase and 140 acre-ft/yr during the operations phase. This water use would be confined to the Great Falls area. Cumulative water use impacts would remain the same as for the Proposed Action.

2.9.2 Surface Water Hydrology and Quality

Site-level impacts of the proposed program upon surface water hydrology and quality would result from several types of construction activities. Most of these impacts involve increased levels of sedimentation because of program-induced land disturbance. Improvements of T/E route bridges which span perennial streams would result in short-duration water quality impacts ranging from low to high at individual sites, depending upon the sensitivity of the stream and the number of bridges to be upgraded along a particular stream. There are 25 miles of T/E routes that parallel streams that may require upgrading. Because of the close proximity of long road lengths to sensitive streams, the short-duration water quality impacts to these streams would be moderate to high. Finally, the construction activities associated with modifications at six launch facilities that are located in proximity to streams with high water quality would result in short-duration, moderate to high water quality impacts. Most of the site-level short-duration water quality impacts would occur only during and immediately following construction activities. These impacts are therefore judged to not be significant. Increased stormwater runoff from Malmstrom AFB and erosion from the HML vehicle operations training area would result in increased local sedimentation to the Missouri River and the potential need for improvements in the offbase stormwater drainage system. This represents a long-duration, moderate, not significant impact at the site level. Water diversions to meet program needs would have only a minor effect upon local streamflows in most cases. No new wastewater discharges would be created by the proposed program and existing wastewater treatment facilities have adequate capacity to handle program-related wastewater. The regional water quality effects of the program would also be low. Therefore, the overall short- and long-duration impacts of the Proposed Action upon surface water hydrology and quality would be low and not significant.

The site-level impacts of the alternatives are the same as for the Proposed Action except that the number of launch facilities undergoing construction under Alternatives 2 and 3 would be larger. Although the number of site-level impacts are likely to be somewhat higher, regional water quality would not be degraded. Therefore, the overall short- and long-duration impacts to surface water hydrology and quality for all alternatives would remain low and not significant.

The Peacekeeper in Rail Garrison program impacts would be limited to the Great Falls area. The program would not appreciably increase the amounts of runoff and sedimentation from Malmstrom AFB into the Missouri River. Therefore, the overall short- and long-duration cumulative impact would remain low and not significant.

2.9.3 Groundwater Hydrology and Quality

Eighteen launch facilities lie near existing saline seeps while another 50 launch facilities lie within high saline-seep hazard areas. Deployment of HMLs at any of these 68 launch facilities could aggregate saline-seep problems at the site level. However, the impact upon regional groundwater quality would be minimal. Only minor amounts of groundwater withdrawals would be needed to support construction in the deployment area. Additionally, small increases in diversions from Big Springs would occur due to

temporary increases in water demand at Lewistown during the construction phase. Overall short-duration impacts to the regional groundwater aquifers from the Proposed Action would be low; long-duration impacts would be negligible. These impacts would not be significant.

Under Alternative 3, construction would occur at all 200 launch facilities and the full extent of site-level saline-seep effects previously summarized would occur. Lesser numbers of launch facilities are involved with Alternatives 1 and 2. The extent of site-level impacts are therefore likely to be less. Regional groundwater quality would not be affected and the overall impacts to the regional groundwater aquifers of all three alternatives would be the same as those of the Proposed Action.

The Peacekeeper in Rail Garrison program would result in negligible additional groundwater impacts. The cumulative impact of the Proposed Action and the Peacekeeper in Rail Garrison program upon groundwater would be the same as for the Proposed Action alone: short-duration, low and long-duration, negligible impacts. None of these impacts would be significant.

2.10 Geology and Soils

The geology and soils resource includes the consideration of effects of the construction and operations of the proposed Small ICBM program at Malmstrom AFB and consists of the following elements: geologic hazards (i.e., mass movements such as landslides), geologic resources (i.e., aggregate and energy resources), and soil erosion. For the Proposed Action, the effects of the on and offbase housing options and the HML vehicle operations training area were considered. Site impacts of road and bridge upgrades were considered for all alternatives.

2.10.1 Geologic Hazards

Seismic activity and seismic effects causing adverse impacts to the proposed program are remote because of low seismicity and the absence of active faults within the deployment area. There would be no impacts to seismicity and seismic effects within the proposed program area because no program activities are planned that would affect these geologic conditions.

The overall short- and long-duration impacts of the Proposed Action to mass movements would be low because the majority of sites have negligible to low susceptibility to mass movements. These impacts would not be significant since adverse effects are not expected to continue beyond the life of the program or require extensive mitigation measures.

Impacts of Alternatives 1 and 2 are the same as for the Proposed Action because the increase in the number of launch facilities used is not enough to change the LOI or significance. Overall impacts to geologic hazards from Alternative 3 are similar to those for the Proposed Action except that all 200 sites would be used. Site impacts to geologic hazards as a result of Alternative 3 would be high at two sites and moderate at eight sites as a result of potential mass movement areas adjacent to launch facilities. In addition, site impacts would be low at 77 sites and negligible at 113 sites since few mass movement characteristics could be attributed to these sites. None of the impacts are considered significant because potential mass movement areas identified are not likely to be affected beyond the life of the program or require extensive remedial measures.

There would be no additional cumulative impacts to geologic hazards from the simultaneous basing of the Peacekeeper in Rail Garrison program and Small ICBM facilities at Malmstrom AFB.

2.10.2 Geologic Resources

Overall short-duration impacts to geologic resources from the Proposed Action would be high as a result of program demand for aggregate exceeding the production capacity of the region. These impacts would be significant because sand and gravel demand depletes regional demonstrated and inferred reserves. Long-duration, moderate impacts would occur since additional reserves would be needed to supply future baseline for aggregate resources. These impacts would not be significant because satisfactory hypothetical reserves and production capacity exist to supply any foreseeable future demand. The Proposed Action may cause short-duration, regional impacts in the Shelby/Conrad and Lewistown areas that are considered high since existing sand and gravel production capacity would be exceeded. These impacts would be significant because demonstrated and inferred reserves would be depleted. Great Falls area short-duration impacts would be moderate and significant because sufficient production capacity exists in the region but demonstrated and inferred reserves would be depleted. Short-duration, site impacts to energy resources from the Proposed Action would be negligible, and long-duration impacts would be negligible to low because of interference with oil and gas leases near some launch facilities and Malmstrom AFB. These impacts would not be significant because the energy reserves affected are not considered appreciable oil, gas, or coal reserves.

Impacts to aggregate for all alternatives are rated the same as for the Proposed Action since the program demand for aggregate for all alternatives is essentially the same as for the Proposed Action. Overall impacts to energy resources for all alternatives are rated the same as for the Proposed Action. For Alternative 3, all 200 launch facilities would be used and short-duration impacts to energy resources would be negligible; long-duration, site impacts would be low at 62 launch facilities and negligible at the remaining 138. None of the energy resource impacts are considered significant.

Cumulative impacts to aggregate resources may occur as a result of the simultaneous basing of the Peacekeeper in Rail Garrison program and Small ICBM facilities at Malmstrom AFB due to the additional demand for aggregate as a result of construction of the garrison, railroad spur, and housing at Malmstrom AFB. The potential added demand, however, is not expected to change the LOI and significance from that determined for the Proposed Action since the combined demand in the Great Falls area does not exceed the production capacity of the area.

2.10.3 Soil Erosion

Short-duration, site impacts would occur to soil erosion from the Proposed Action in the deployment area as a result of launch facility expansion and road and bridge improvements. Site impacts range from negligible to high as a result of program-induced erosion of low to highly sensitive soils; these impacts would not be significant because soil erosion controls would be promulgated after construction upgrades are completed. Site-level soil erosion impacts are considered of long duration and high and significant only at the proposed HML vehicle operations training area as a result of removal of topsoil at a rate greater than the soils natural regenerative capabilities. This removal would result in an appreciable loss of topsoil due to disturbance of the soil by training activities. Overall long-duration collective impacts to soil erosion from the Proposed

Action would be negligible due to post-construction soil erosion controls and recovery of vegetation in the construction areas.

Impacts for Alternatives 1, 2, and 3 are rated the same as for the Proposed Action. More launch facilities would be used for Alternative 2, but this would not change the LOI or significance. Since Alternative 3 would use all 200 launch facilities as opposed to 100 for the Proposed Action, short-duration, site impacts to soil erosion in the deployment area range from negligible to high due to the low to high susceptibility of soils to erosion in the launch facility area. These site impacts would not be significant because of post-construction soil erosion controls that would be instituted. Short-duration impacts for all 200 launch facilities would be high at 33 sites, moderate at 10 sites, low at 81 sites, and negligible at 76 sites. Long-duration impacts to soil erosion would be negligible for all deployment area construction sites due to post-construction erosion control practices and recovery of vegetation. Impacts to soil erosion at the HML vehicle operations training area are the same as for the Proposed Action.

Cumulative impacts to soil resources would occur as a result of the simultaneous location of the Rail Garrison facility (including railroad spurs to the main line, and additional housing in addition to the Small ICBM facilities) on Malmstrom AFB. The LOI and significance, however, are not expected to change from that of the Proposed Action because only small and/or temporary disturbances are anticipated.

2.11 Air Quality

The air quality analysis includes the consideration of effects of the construction, operations, and deployment of the Small ICBM program at Malmstrom AFB. The primary pollutants considered were those associated with transportation, such as carbon monoxide (CO), and those resulting from construction disturbance, such as fugitive dust. In addition, sulfur dioxide, nitrogen oxides, and fugitive dust, served as indicators for visibility impact analyses. Impacts of onbase and offbase housing options and the HML vehicle operations training area were also considered. For the Proposed Action, short- and long-duration impacts on Great Falls traffic corridors from vehicular CO during the construction and operations phases would be negligible. Construction-related fugitive dust impacts would be low and not significant on Great Falls air quality; however, they would not exceed the National Ambient Air Quality Standards. The impacts from fugitive dust resulting from construction activities at the launch facilities, along deployment area roads, and at bridge improvement sites would be negligible. Regional visibility impacts resulting from construction at Malmstrom AFB would be negligible. Overall, short-duration impacts are rated low and not significant and long-duration impacts are expected to be negligible.

For Alternatives 1, 2, and 3, impacts resulting from vehicular CO emissions, construction-related fugitive dust, and visibility degradation are expected to vary only slightly from those of the Proposed Action. Therefore, the short-duration impacts are also judged to be low and not significant and the long-duration impacts would be negligible.

The cumulative impacts resulting from the concurrent basing of the Small ICBM and the potential Peacekeeper in Rail Garrison program at Malmstrom AFB would be low and not significant during the construction phase and would not contribute to the violation of ambient air quality standards. No cumulative impacts at launch facilities would occur. The long-duration impacts from Peacekeeper in Rail Garrison basing are predicted to be negligible.

2.12 Noise

The noise analysis includes the consideration of construction and operations of the Small ICBM at Malmstrom AFB. Short-duration impacts are derived from construction-related equipment and long-duration impacts come from operations and employee vehicle traffic. For the Proposed Action, the impact analysis included both housing options and the HML vehicle operations training area. The proposed program construction-related noise would result in short-duration, negligible impacts in and around Malmstrom AFB; however, in the deployment area, there is some chance for those residents living near these potential construction areas (near launch facilities, road improvements, and bridge construction sites) to be temporarily disturbed due to the construction activity at these facilities. These short-duration impacts are projected to be moderate and not significant. Long-duration traffic noise generated during the construction and operations phase would result in negligible impacts to Great Falls traffic corridors and throughout the deployment area.

Noise impacts for Alternatives 1, 2, and 3 are expected to vary only slightly from those of the Proposed Action. With construction at 125 launch facilities for Alternative 2 and 200 launch facilities for Alternative 3, noise impacts would be somewhat more widely distributed than either the Proposed Action or Alternative 1, which each require only 100 launch facilities. However, these short-duration impacts are rated only moderate and not significant for all alternatives. Long-duration noise impacts in all cases would be negligible.

Cumulative noise impacts from concurrent basing of the Small ICBM with the potential Peacekeeper in Rail Garrison program would consist of additional short-duration noise generated during construction of the garrison facilities, construction of a spur track connecting to the main line, and construction of additional housing. Most of these activities would be concentrated in the southeast area of the base, away from sensitive receptors. Cumulative short- and long-duration impacts for noise within the affected area on and adjacent to Malmstrom AFB would be negligible. In the deployment area, short-duration construction noise impacts would be the same as the Proposed Action (moderate and not significant).

3.0

3.0 AFFECTED ENVIRONMENT

This chapter describes the potentially affected environment at the proposed deployment area in north-central Montana, including Malmstrom Air Force Base (AFB). Because proposed Small Intercontinental Ballistic Missile (ICBM) operations would likely be extended into the early part of the next century, it is necessary to develop projections of future conditions against which program impacts can be compared. Therefore, both existing and future baseline conditions without the program are discussed in this chapter. Future baseline conditions include deployment of the new KC-135R air refueling mission. The baseline conditions for the affected environment are discussed in terms of the specific resource categories that were presented and compared in Chapter 2.0.

The existing environmental conditions at each launch facility are summarized in tabular form in Appendix A. Appendix A includes data relating to biological resources and threatened and endangered species, geology and soils, water resources, land use, and cultural resources. Appendix A also includes certain basic information about each launch facility, such as its size and distance from Malmstrom AFB.

3.1 Socioeconomics

Deployment of the proposed Small Intercontinental Ballistic Missile (ICBM) system at Malmstrom Air Force Base (AFB) in north-central Montana would affect the socioeconomic environment of the area. To assess this environment, six major topics are addressed in the socioeconomics analysis: economic base, demographics, housing, education, public services, and public finance.

3.1.1 Resource Description

The analysis included in this site-specific Environmental Impact Statement (EIS) addresses socioeconomic issues in greater detail than in the Legislative Environmental Impact Statement (LEIS) prepared earlier for this program. These issues include impacts at the state level, on individual counties and communities, and for a broader range of socioeconomic factors. These issues were identified through the public scoping process. This expanded analysis provides forecasts of economic factors needed for the analysis of program impacts (Chapter 4.0) on socioeconomics as well as other resource areas. In addition, new activity at Malmstrom AFB, including a KC-135R air refueling wing has been incorporated into the baseline analyses.

3.1.1.1 Economic Base

The economic base element describes the economic conditions and industrial composition of the study area or Region of Influence (ROI) (see definition in Section 3.1.2.1). The civilian labor force, employment, unemployment, and income are the principal measures used to assess historical and future economic changes. For purposes of future analyses, changes in major industrial sectors, including the military and construction industry, are identified.

3.1.1.2 Demographics

The demographics element presents a demographic profile of population in the area, and identifies impact-sensitive variables for quantification and baseline projections. These variables include military-civilian and urban-rural population distributions.

3.1.1.3 Housing

The housing element describes the permanent and temporary housing stock of major communities in the study area. Permanent or year-round housing includes single-family, multi-family, and mobile home structures. Changes in the size and composition of the housing stock, including the number of vacancies available for either rent or purchase, are major considerations in the evaluation of permanent housing.

Temporary or transient housing consists of hotel and motel rooms, recreational vehicle pads, and camping (tent) spaces. The total number of accommodations and their availability during average and peak seasons are considered.

3.1.1.4 Education

The education element describes major public and private school systems in the study area. Special attention is given to public elementary and secondary school districts. Student enrollment, staff levels, and facility capacities are addressed for each educational organization.

3.1.1.5 Public Services

The public services element describes major service functions of county and municipal jurisdictions within the study area. This element describes major county functions which include the sheriff, fire protection, public health, human services, and city functions which include the police and fire departments. Total local government employment for identified jurisdictions is addressed as a general indicator of other functions such as public works, community development, recreation, and libraries. Some governmental activities such as planning, housing, and health are managed jointly by both the city and county. The number of personnel employed by each jurisdiction or organization, appropriate workload measures, and equipment and facilities capacities for selected services is used to evaluate the operational capabilities of each organization or department. If private or quasi-private provision of any service plays a major role, representative organizations are discussed.

3.1.1.6 Public Finance

The public finance element describes the fiscal conditions of the counties, cities, and school districts within the study area. Annual operational and capital expenditures by fund or function, and revenues by source, are the principal measures used to describe fiscal conditions for each jurisdiction.

3.1.2 General Analysis Methodology

3.1.2.1 Region of Influence

The ROI was defined for the socioeconomics analysis at two levels. This ROI expands on the scope presented in the LEIS by enlarging the regional analysis from an initial nine-county area to the state level, and by focusing on all affected counties and municipalities rather than only the main operating base county. The first level is the State of Montana which will serve as a major source of program-required manpower and construction materials. Although some construction labor is expected to come from nearly every county within the state, those counties immediately adjacent to Malmstrom AFB and the deployment area will supply the majority.

The second level of analysis includes those counties and communities that are likely to experience appreciable temporary or permanent inmigration of workers and their dependents during construction, assembly and checkout (A&CO), and operation of the Small ICBM program. The City of Great Falls in Cascade County, the host community for Malmstrom AFB, will experience considerable economic and demographic changes as a result of the proposed program. Two other cities, Lewistown in Fergus County and Conrad in Pondera County, are centrally located for construction activities in the deployment area and will, to a lesser degree, experience program-related economic and demographic changes. These three cities and counties are the primary study area for the demographics, housing, education, public services, and public finance analyses. Six other counties within the deployment area, including Chouteau, Judith Basin, Lewis and Clark, Teton, Toole, and Wheatland, may experience some economic effects and were included in individual elements as appropriate.

3.1.2.2 Economic Base

The analysis of economic baseline conditions considered two major components: (1) a compilation of historic data and (2) baseline (without-program) forecasts. The principal factors in the analysis were employment and income. Historic data for these variables were readily available from the Montana Census and Economic Information Center, Montana Department of Labor and Industry, the U.S. Bureau of Economic Analysis (BEA), and other state and federal sources.

Published baseline projections for the State of Montana, its substate regions, and particular counties were adapted and updated for this analysis. Recent projections through 1989 for the State and its component regions were obtained from the University of Montana, Bureau of Business and Economic Research. Earlier projections to the year 2000 for Montana counties, prepared by the Montana Department of Commerce, were used where appropriate. Forecasts for the Great Falls urban area prepared for the 1985 Mountain West Research-North, Inc. Great Falls Transportation Study Area Report were also used as inputs to this analysis. These available projections were revised to incorporate new missions proposed for Malmstrom AFB but not included in the original forecasts, including a KC-135R air refueling mission. Assumptions about long-term trends in the private sector of the state's economy were developed based on discussions with knowledgeable local government officials, business leaders, and university economists.

3.1.2.3 Demographics

Changes in the size and characteristics of population in the region are important determinants of needs for local services. Moreover, population changes can influence the social fabric of a community as newcomers interact with current residents. The principal variables used to evaluate these effects are the size of the relocating population, the urban-rural residence choices of newcomers, and the military-civilian composition of population changes. Other factors, such as family size and percentage of relocating workers accompanied by families, were used in the analysis but not directly evaluated.

Population data for 1970, 1980, and 1984 (the latest year for which information is available) formed the basis for analysis of current demographic conditions and recent trends. The current size and demographic composition of the population in potentially affected communities, counties, and the state as a whole were reported and future baseline projections were based on historic data. Likewise, future baseline projections for the demographic composition of military personnel (and dependents) stationed at

Malmstrom AFB were estimated from employment records at the base for the period from 1961 through 1986, as well as from information related to future missions.

Population forecasts prepared by state and local agencies were updated to account for more recent developments. Anticipated changes in population due to future Malmstrom AFB missions were factored into these baseline forecasts.

3.1.2.4 Housing

The existing baseline conditions for the permanent year-round housing stock in the cities of Great Falls, Lewistown, and Conrad were based on 1980 U.S. Bureau of the Census estimates. These data were updated using local sources (1985 Federal Home Loan Bank of Seattle's Housing Vacancy Survey, Great Falls Metropolitan Statistical Area realtors, and other housing publications). Housing demand projections were prepared using estimates of baseline future populations and assumptions of persons per household. Housing supply projections were derived from projected vacancy rates, and for Great Falls, growth patterns within the city.

Baseline supply data for temporary housing units were collected from primary sources. Supply and demand projections were prepared using assumptions provided by local proprietors and the Great Falls Area Chamber of Commerce.

3.1.2.5 Education

Historical enrollments, pupil-to-teacher ratios, and facility use were used to evaluate the service level of the school districts of Great Falls, Lewistown, and Conrad. Baseline enrollment projections for the Great Falls Public Schools (GFPS) were extracted from the GFPS report: A Demographic Study for the School District by Attendance Areas. The GFPS baseline projections were modified to reflect planned Malmstrom AFB missions for the period 1988 through 1990. The enrollment projections and historical pupil-to-teacher ratios formed the basis for projections of baseline teacher requirements.

The future enrollments for the school districts in Conrad and Lewistown were projected to remain at approximately the 1986-1987 levels based upon discussions with the respective school superintendents.

3.1.2.6 Public Services

Staffing, program descriptions, and major equipment and facilities were analyzed for selected public services. Historical service delivery patterns were studied to determine peak-service requirements and their correlation to population change. Previous studies have shown that public safety, health, and human services are most likely to experience increases in demand as a result of population growth. Therefore, baseline projections for service delivery capabilities were made for police and fire protection in the cities of Great Falls, Lewistown, and Conrad; sheriff, fire protection, health, and social services in Cascade County; and sheriff, health, and hospitals for Fergus and Pondera counties. An evaluation of total governmental employment in each of these jurisdictions was used as an indicator of other public services not specifically addressed.

3.1.2.7 Public Finance

Historical trends in public finance were analyzed for revenues, expenditures, taxable value of property, and the demographic and economic conditions for each jurisdiction in

order to quantify the relationships among them. Financial data for the cities and counties were derived from the annual reports of those jurisdictions and reflect actual revenue and expenditure levels of the governmental funds of each jurisdiction. The school district data reflect budgeted revenues and expenditures of each district's general fund. These parameters, in addition to discussions with local officials, were used to forecast baseline growth in revenues and expenditures. Baseline expenditures for major capital and equipment needs were estimated on a case-by-case basis.

3.1.3 Existing and Future Baseline Conditions

3.1.3.1 Economic Base

Montana's economy experienced substantial growth during the 1970s. The state's employment grew at an average annual rate of 3.2 percent, while inflation-adjusted personal income grew 3.1 percent annually. Unless otherwise specified, all dollar values in this report are 1986 dollars, and all dollar comparisons are adjusted for inflation. By comparison, nationwide job growth averaged only 2 percent per year during the decade, though United States personal income grew an average of 3.3 percent per year. Rising international prices of energy, agricultural products, and other resource-based commodities contributed to the strong state performance, leading to high rates of investment and income generation. North-central Montana, specifically the nine counties containing the 341st Strategic Missile Wing's launch facilities, shared in this economic growth. Regional employment expanded 2.4 percent annually, and income rose an average of 1.7 percent annually.

The state and regional economic situation deteriorated substantially between 1980 and 1984. Statewide employment growth amounted to just 0.6 percent per year, and personal income grew only 1.6 percent annually. North-central Montana's total employment stood at 87,900 in 1980 and was measured at about that same level in 1984. Regional income grew just 1.1 percent per year between 1980 and 1984.

Within the north-central Montana region, three communities are of particular importance because of their proximity to Malmstrom AFB and the deployment area for the proposed program. These are Great Falls in Cascade County, the location of Malmstrom AFB; Lewistown in Fergus County, the likely support location for construction activity for the eastern portion of the deployment area; and Conrad in Pondera County, the likely support center for construction activity for the northwestern part of the missile field.

Cascade County. The Great Falls area's economy is dominated by the agriculture, government, trade, and service sectors. Wheat and barley are the principal farm products of the area. Livestock and dairy operations are also prevalent. Great Falls serves as the regional trade, finance, and transportation center of north-central Montana and parts of southern Alberta, Canada.

The public sector and medical services are the area's principal employers. The U.S. Air Force is the largest single employer in the area, with approximately 3,700 military and 1,150 civilian jobs at Malmstrom AFB. Civilian positions include 640 nonappropriated fund and contractor personnel employed onbase. Employment at Malmstrom AFB is followed by employment in the various local jurisdictions in the area: GFPS (1,830), City and County offices (1,100), and at the two major hospitals in Great Falls (1,100 at Montana Deaconess Medical Center and 750 at Columbus Hospital). Sletten Construction Company, Hilde Construction, Buttrey Foods, K-Mart, and the Burlington Northern Railroad Company also employ between 200 and 500 workers each.

In the past few years the area has suffered relative economic stagnation. This decline has resulted from several factors:

- Low agricultural commodity prices;
- Poor rainfall from 1983 to 1985;
- Closing of the Anaconda mine and smelter operation;
- Reduced purchasing power of the Canadian dollar due to exchange rate movements;
- Low oil and natural gas prices; and
- Railroad consolidation.

Cascade County employment fell by about 800 jobs between 1980 and 1984; from 41,600 to 40,800 (Table 3.1.3-1). Jobs in both the farm and government sectors declined. The reduction in government employment exceeded 800 jobs. These losses were shared by the military (including Malmstrom AFB), federal civilians, and state and local government workers. Private nonfarm jobs grew slightly in number between 1980 and 1984. Gains in services and finance more than offset reduced employment in manufacturing, transportation, construction, and wholesaling.

County personal income, adjusted for inflation, grew at an average annual rate of 1.4 percent between 1980 and 1984. This increase occurred despite a slight reduction in employment because of increases in nonlabor income. Earnings (in then-year dollars) in some key sectors fell substantially during these years, with farm earnings reduced 56 percent and manufacturing earnings down 13 percent. Unemployment in the county was measured at 7.6 percent in 1984, slightly higher than the 1980 rate of 7.3 percent, but down from the 9-percent rate observed in 1983.

Employment at Malmstrom AFB is a major component of the county's economy. Total appropriated fund staffing levels at the base have fluctuated from 4,400 in 1961, to a peak of 6,300 in 1976. Since that time, base employment has decreased to a 25-year low of 4,200 in 1986 (Figure 3.1.3-1). Approximately 2,000 jobs were lost at the base in the prior 10 years as activity declined due to phasing out of North American Air Defense (NORAD) and KC-97 refueling missions at the base. Future increases related to the KC-135R air refueling mission, will add as many as 700 jobs onbase between 1986 and 1990.

A 1985 Mountain West Research-North, Inc. Great Falls Transportation Area Study of economic and demographic trends in the Great Falls area projected a gradual recovery from the adverse economic conditions of the early 1980s. Stable output or modest growth was expected for the major nongovernment sectors of the county's economy (agriculture, health services, and retail trade) with additional positive results from state and local economic development efforts. More recent projections by the University of Montana's Bureau of Business and Economic Research predict growth in nonfarm earnings and personal income in Cascade County at about 1.5 percent per year through 1989. Construction employment is expected to be stable for the foreseeable future, while services and trade are likely to exhibit modest growth.

Table 3.1.3-1

Changes in Employment and Earnings for Selected Sectors, Cascade, Fergus, and Pondera Counties, Montana 1980-1984

County and Sector	Employment (Jobs) 1980	Employment (Jobs) 1984	Employment (Jobs) 1980-1984 Change	Earnings (Thousands $) 1980	Earnings (Thousands $) 1984	Earnings (Thousands $) 1980-1984 % Change
Cascade County						
TOTAL:	41,610	40,836	-774	$522,460	$645,998	23.6%
Farm	1,072	1,035	-37	5,929	2,584	-56.4
Nonfarm	40,538	39,801	-737	516,531	643,414	24.6
Private	30,015	30,105	90	372,776	470,156	26.1
Construction	2,163	2,086	-77	42,581	48,206	13.2
Manufacturing	1,653	1,326	-327	33,159	28,741	-13.3
Finance	3,457	3,719	262	40,917	49,904	22.0
Services	9,716	10,068	352	94,863	141,059	48.7
Other Private	13,026	12,906	-120	161,256	202,246	25.4
Government	10,523	9,696	-827	143,755	173,258	20.5
Fergus County						
TOTAL:	6,224	5,927	-297	$66,434	$64,704	-2.6%
Farm	1,102	1,071	-31	11,355	2,740	-75.9
Nonfarm	5,122	4,856	-266	55,079	61,964	12.5
Private	3,991	3,819	-172	41,065	45,657	11.2
Construction	461	371	-90	7,345	4,610	-37.2
Services	1,208	1,288	80	10,139	14,704	45.0
Other Private	2,322	2,160	-162	23,581	26,343	11.7
Government	1,131	1,037	-94	14,014	16,307	16.4
Pondera County						
TOTAL:	3,282	3,288	6	$31,683	$36,104	14.0%
Farm	778	748	-30	6,559	2,952	-55.0
Nonfarm	2,504	2,540	36	25,124	33,152	32.0
Private	2,037	2,068	31	20,153	26,317	30.6
Mining	53	46	-7	1,649	1,495	-9.3
Construction	159	202	43	1,682	3,129	86.0
Other Private	1,825	1,820	-5	16,822	21,693	29.0
Government	467	472	5	4,971	6,835	37.5

Note: Earnings data are in then-year dollars, not adjusted for inflation.

Source: U.S. Bureau of Economic Analysis, Regional Economic Information Systems, 1986.

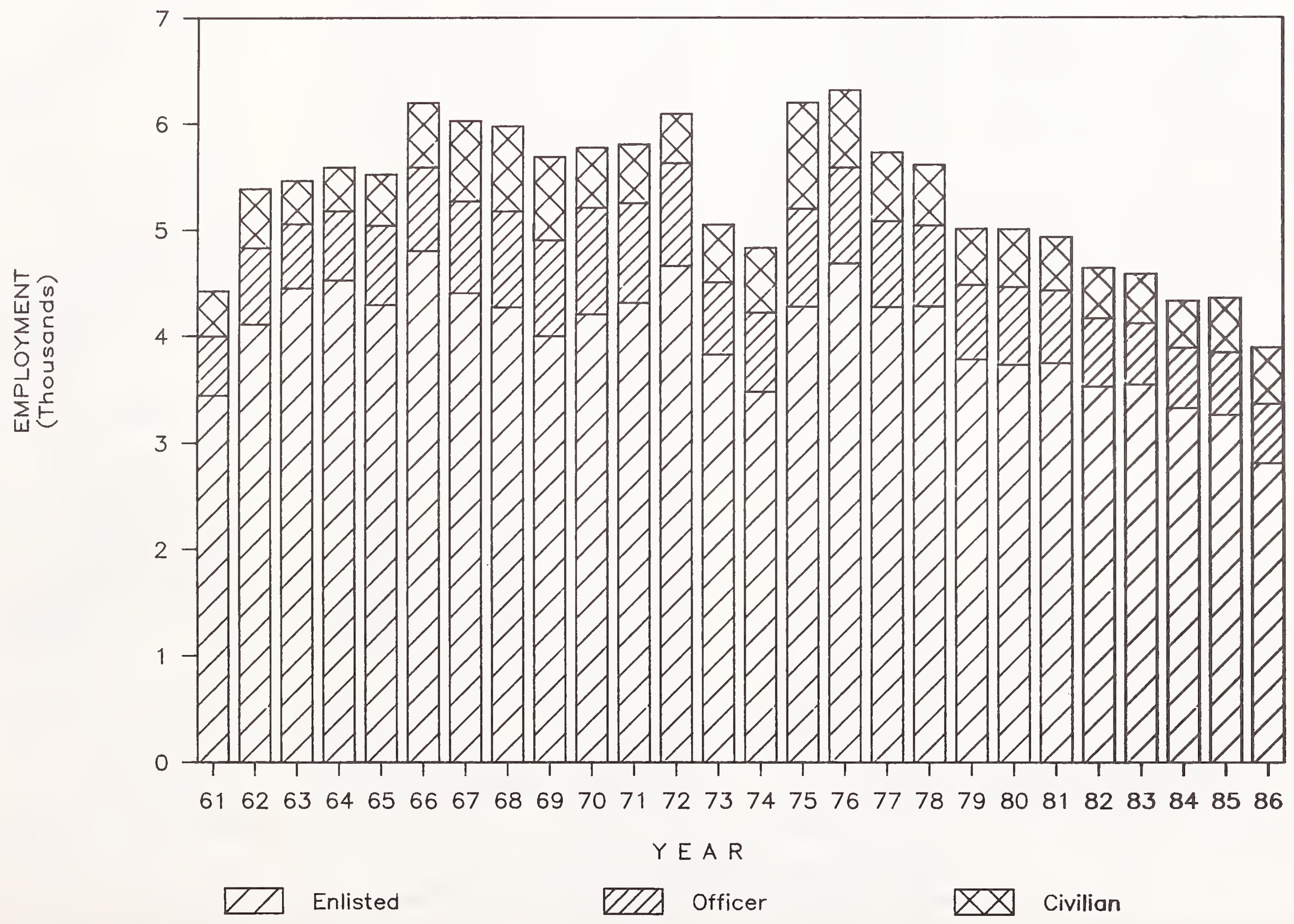


FIGURE 3.1.3-1 MILITARY AND APPROPRIATED FUND CIVILIAN EMPLOYMENT AT MALMSTROM AFB, 1961 TO 1986

Fergus County. Total employment in Fergus County was measured at 5,900 jobs in 1984, down 300 jobs from 1980 (Table 3.1.3-1). Farm employment represented 18 percent of all county jobs in 1984, reflecting the largely agricultural base of the county's economy. Recent declines in employment have been spread proportionately across the farm, private nonfarm, and government sectors. Only the service sector has registered appreciable net job gains since 1980.

Personal income declined by about 5 percent between 1980 and 1984 in Fergus County. Farm earnings led this decline, registering a 76-percent reduction during these years (in then-year dollars). Construction earnings (in then-year dollars) fell 37 percent over the same period, while service and trade earnings grew by 45 and 11 percent, respectively. Unemployment in the county amounted to 6.6 percent of the civilian labor force in 1984, down from the 1982 rate of 7.8 percent but still well above the 4.8-percent rate observed in 1980.

Pondera County. Pondera County employment stood at 3,300 jobs in 1984, virtually unchanged from its 1980 level (Table 3.1.3-1). The county is largely dependent on farming and ranching, with agriculture representing 23 percent of total employment. Farm employment has dropped slightly since 1980, though this was offset by a modest gain in nonfarm jobs. Oil production also plays a key role in the local economy. Jobs and earnings in the County's mining sector declined from 1980 to 1984, reflecting the general weakness in oil prices and poor industry performance during this period.

Personal income of Pondera County residents increased very slightly between 1980 and 1984, at an average annual rate of 0.7 percent. However, earnings from agriculture (in then-year dollars) were off 55 percent from 1980 to 1984. Unemployment was measured at 5.8 percent of the labor force in 1984, having fluctuated from 3.3 percent to 6.3 percent during the 1980 to 1984 period. Addition of a permanent Air Force Strategic Training Range installation near Conrad increased area jobs by about 70 positions, most of them military.

3.1.3.2 Demographics

Montana had a 1984 population estimated at 824,000. Given its relatively large area, it is one of the least densely populated states in the nation. The state's population has increased at an average annual rate of 1.2 percent since 1970. This growth is nearly identical to the 1.1 percent per year observed nationwide for this period. State population growth averaged 1.3 percent annually in the 1970s and 1.2 percent from 1980 through 1984. The slowdown in the state economy after 1980 increased unemployment, but did not measurably reduce the rate of growth of population.

The nine north-central Montana counties containing Malmstrom AFB and the launch facilities of the 341st Strategic Missile Wing have recently experienced population growth below the state average (Table 3.1.3-2). The 1984 population of the nine counties totaled about 171,000. This regional total increased at an average annual rate of only 0.6 percent from its 1970 level of 158,000.

Cascade County. Cascade County, the most populous county in north-central Montana, includes Great Falls and Malmstrom AFB. The county had a 1984 population of 81,800, almost identical to its population in 1970 and just slightly above its 1980 population of 80,700; the City of Great Falls population was estimated at 58,800 persons, down from its 1970 population of 60,100 but up from its 1980 population of 56,700.

Table 3.1.3-2

Actual and Projected Populations of Selected Montana Counties and Cities, the State of Montana, and the United States 1970-2000

County and City	1970	1980	1984	1990	2000
Cascade	81,804	80,696	81,815	87,400	89,900
Great Falls	60,091	56,725	58,769	61,500	63,500
Chouteau	6,473	6,092	6,175	6,100	5,800
Fergus	12,611	13,076	12,929	13,300	13,600
Lewistown	6,437	7,104	6,895	7,100	7,300
Judith Basin	2,667	2,646	2,705	2,400	2,200
Lewis and Clark	33,281	43,039	45,766	51,100	59,500
Pondera	6,611	6,731	7,072	7,200	7,500
Conrad	2,770	3,074	3,056	3,400	3,700
Teton	6,116	6,491	6,444	6,500	6,400
Toole	5,839	5,559	5,742	5,700	5,700
Wheatland	2,529	2,359	2,308	2,200	2,100
REGIONAL TOTAL:	157,931	166,689	170,956	181,900	192,500
Montana	694,409	786,690	824,057	859,900	935,600
United States (thous.)	203,302	226,546	236,634	249,900	268,300

Note: For Cascade County and Great Falls, projections were prepared from the Great Falls Transportation Study Area Report, Mountain West Research-North, Inc. 1985.

Sources: U.S. Bureau of the Census 1972, 1982b; Montana Department of Commerce 1981, 1986; Data Resources, Inc. 1985; Council of Economic Advisors 1986.

The county's population in 1980 was 94.2 percent white, 3.3 percent American Indian, 1.2 percent black, and 1.3 percent of other racial origins. This is generally similar to the racial composition of Montana's population statewide, with 94.1 percent white, 4.7 percent American Indian, 0.2 percent black, and 1 percent of other races.

According to U.S. Bureau of the Census data sources, 70.3 percent of Cascade County's population in 1980 lived within the city limits of Great Falls, and 82.1 percent of county residents lived within the urbanized area of Great Falls. In 1980, these percentages were 73.5 percent and 86.7 percent, respectively.

The school-age population (ages 5-17 years) declined in the county from 1970 to 1980, both in absolute numbers and as a share of total population. County school-age residents declined from 23,500 in 1970 to 17,000 in 1980, while their share of county population fell from 28.7 percent to 21.1 percent. The City of Great Falls and its urbanized area experienced a similar trend.

The population of military personnel and their dependents in the Great Falls area was estimated at about 9,060 persons in 1986. This is about 34 percent below the area's peak estimated military population of 13,760 in 1972 and 13,660 in 1976. The decline of military population resulted from phasing out NORAD and KC-97 refueling missions at the base. The military population of Great Falls and Malmstrom AFB stood at about 20.4 percent of the urbanized area's population at the 1972 peak. By 1986, this figure had fallen to 12.9 percent of urban area population. Figure 3.1.3-2 plots the trend in estimated military population of the Great Falls area from 1961 to 1986.

The number of military personnel and dependents in the Great Falls area is projected to increase from 9,060 in 1986 to 10,700 in 1990. These increases are due to the new KC-135R air refueling mission located at Malmstrom AFB.

County population is projected to increase very gradually through the year 2000, from a 1984 level of 81,800 to a projection of 89,900 for the year 2000. About 70 percent of this growth is forecast for the urban planning area around Great Falls. The population of the urban area is projected at 72,700 in 1990 and 74,700 in the year 2000.

Fergus County. The population of Fergus County was estimated at 12,900 persons in 1984. This was a slight increase from its 1970 level of 12,600. The incorporated City of Lewistown, the county seat and the largest center of population in the County, had a 1984 population estimated at 6,900. This also represented an increase (by nearly 500) from the city's 1970 population. However, in the case of both the city and county, the increase in population occurred from 1970 to 1980. Lewistown recorded a decrease in population of about 200 between 1980 and 1984.

Fergus County's school-age population declined in both absolute numbers and as a share of total population between 1970 and 1980. The 1970 school-age population (3,600) fell to the 1980 mark of 2,700. In proportionate terms, this was a countywide decline from 28.9 to 20.9 percent of total population over the decade. Lewistown's 1980 school-age population equaled 19.5 percent of total city population. The 1980 population for the county was 98.7 percent white, and consequently contained fewer minorities as a share of total population than the state as a whole.

Lewistown's share of Fergus County's population stood at 53.3 percent in 1984. This constituted a marginal increase from 1970, when the city contained 51 percent of the county's population.

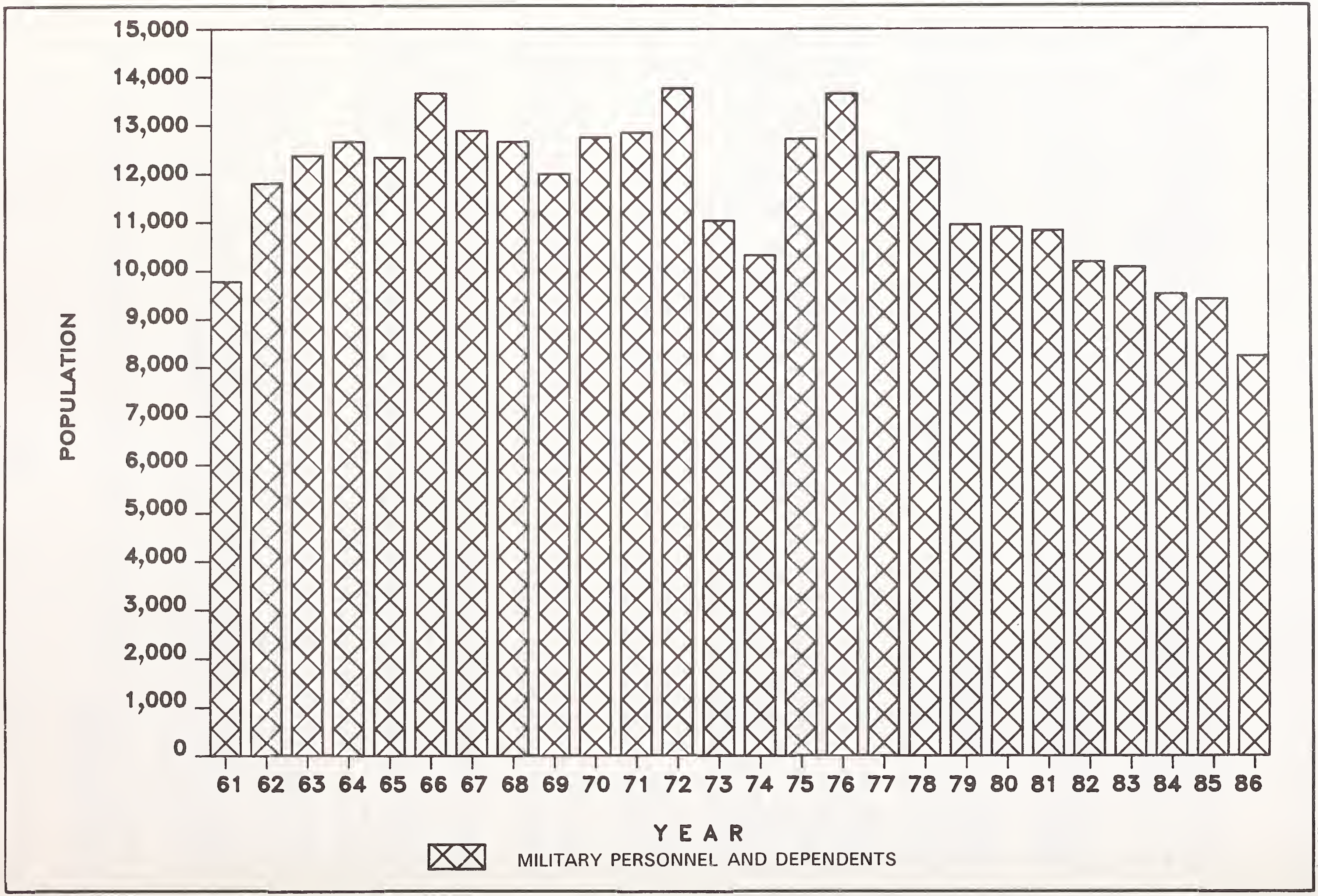


FIGURE 3.1.3-2 MALMSTROM AFB MILITARY POPULATION IN THE GREAT FALLS URBAN AREA, 1961 TO 1986

Fergus County's population is projected to grow slightly, to 13,600 by the year 2000, while Lewistown's population would increase to 7,300 in the same period.

Pondera County. The county's 1984 population is estimated at about 7,100. This was an increase over the 1970 level of 6,600. The county seat of Conrad had a 1984 population estimated at approximately 3,100, also an increase from its 1970 level of 2,800. Conrad's population showed no net change between 1980 and 1984, though the County's population increased during this period by about 400.

County population in 1980 was 89.9 percent white, 9.7 percent American Indian, and 0.4 percent of other racial origins. This is a higher concentration of American Indians in the county's population than is the case for the state as a whole (4.7% American Indian statewide).

The share of Pondera County's population residing in Conrad was estimated at 43.2 percent in 1984, very similar to the 1970 distribution (41.9% residing in Conrad).

The school-age population of Pondera County declined measurably between 1970 and 1980, from 2,100 in 1970 to 1,500 in 1980. The share of total county school-age population fell from 31.2 percent in 1970 to 22.6 percent in 1980. The school-age population of the City of Conrad was a very similar share of total city population in 1980, 21.7 percent.

Both Pondera County and the City of Conrad are projected to gradually gain population through the year 2000, reaching approximately 7,500 for the county and 3,700 for the city.

3.1.3.3 Housing

City of Great Falls.

Permanent Units. In 1980, the U.S. Bureau of the Census reported 23,977 permanent year-round housing units in the City of Great Falls. Of this number, 13,831 (57.7%) units were owner-occupied and 8,048 (33.6%) units were renter-occupied. The remaining 2,098 units (8.7%) were vacant. Of these vacant units, 320 were vacant "for sale only," 1,327 were vacant "for rent," 162 were rented or sold awaiting occupancy, 54 were held for occasional use, 10 were boarded up, and 225 were classified as "other vacant." The number of available vacant units was 1,647 (320 vacant "for sale only" and 1,327 vacant "for rent") or 6.9 percent. The most recently published Housing Vacancy Survey for the Great Falls area (November 1985) estimated the total year-round housing stock at 27,938, and the available vacant units at 1,081 or 3.9 percent of the total. There were 22 units identified as being under construction.

The Great Falls urban area, (Figure 3.1.3-3) which corresponds to the Great Falls Transportation Area Study boundaries, includes most of census tracts 1 through 20. The total number of permanent year-round units in these 20 tracts was estimated at 27,253 in 1980. Vacancies were estimated to be 2,240 (8.2%), with 337 units vacant "for sale only," 1,385 units vacant "for rent," 232 units awaiting occupancy or held for occasional use, and 286 units classified as "other vacant." The total number of available vacant units was 1,722 (337 and 1,385) or 6.3 percent. Using the Housing Vacancy Survey, an estimate of the 1985 units in the urban area was derived. This estimate identified 29,151 permanent year-round units, 1,745 of which were vacant. These vacancies were broken down as follows: 237 vacant "for sale only," 974 vacant "for rent," 248 awaiting

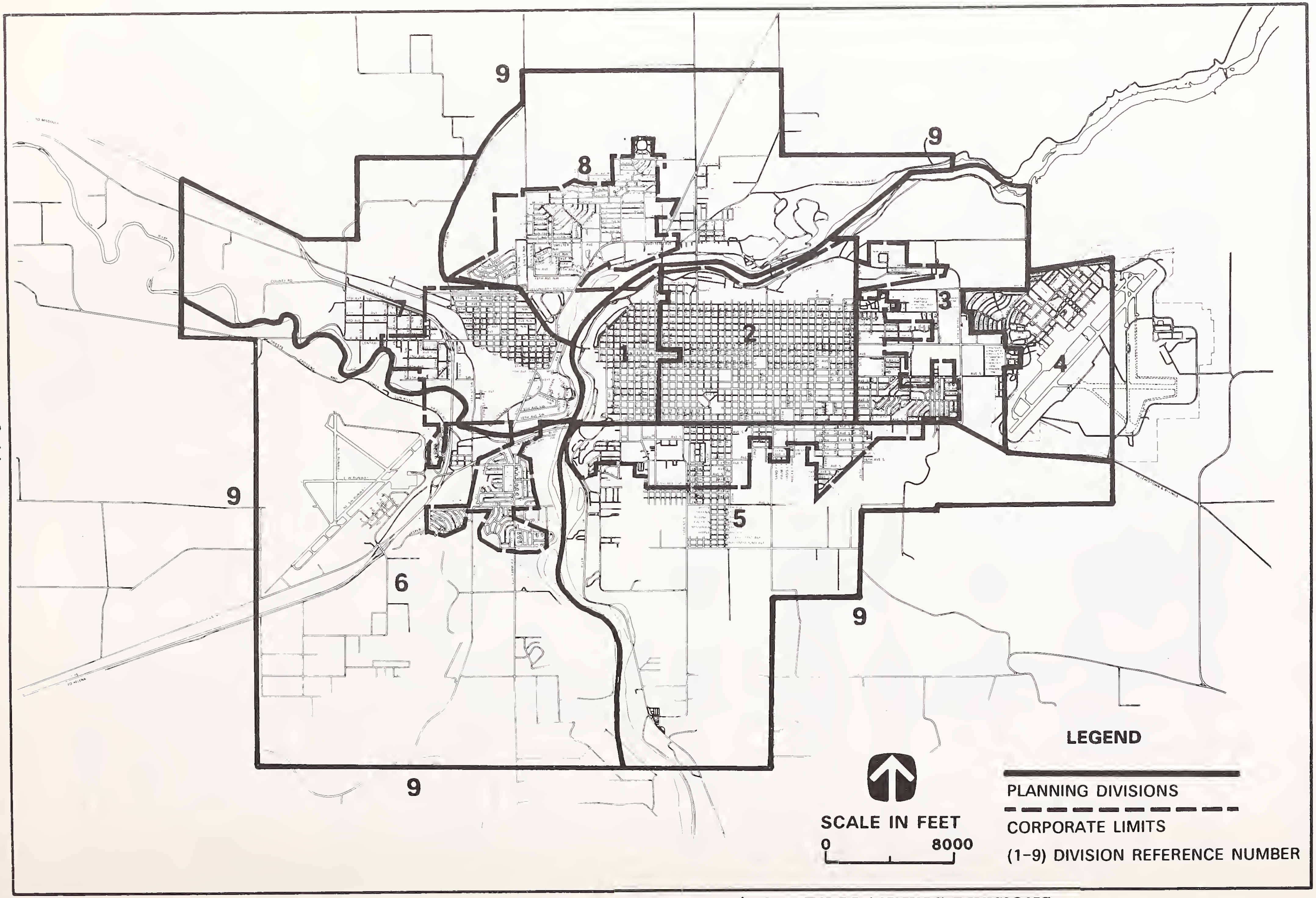


FIGURE 3.1.3-3 CITY OF GREAT FALLS AND CASCADE COUNTY CITY/COUNTY PLANNING DIVISIONS

EM3-SO/3

occupancy or held for occasional use, and 286 "other vacant." The available vacancies were estimated to be 1,211 (237 and 974) or 4.2 percent.

There are 2,030 low-income housing units in Great Falls including 60 under construction (Table 3.1.3-3). Of these units, 1,542 are identified as being family units. Low-income housing units in Great Falls are at capacity and are not available in sufficient quantities to meet the current demand.

Based on the demand created by population growth, the supply of permanent housing units in the Great Falls urban area is expected to grow from 29,900 units in 1990 to 30,700 units by the year 2000. Available vacancies are projected to number 1,100 (3.7%) in 1990 and 1,050 (3.4%) in the year 2000. This change in permanent housing includes the effects of the KC-135R air refueling mission. The percent of total units that will be vacant awaiting occupancy or held for occasional use is expected to remain at about 0.85 percent, while the number of units classified as "other vacant" will remain under 300. An additional 90 units of low-income housing are currently in the planning stage and should be completed by 1989.

Temporary Units. The temporary housing stock in the City of Great Falls includes hotel/motel rooms and tent/recreational vehicle spaces. In 1986, the city had 32 hotels/motels and 4 private campgrounds. The 32 hotels/motels have approximately 1,600 rooms with an average vacancy rate of about 50 percent (800 rooms). During the peak season, June to August, the vacancy rate decreases to about 25 percent (400 rooms). Three to four weekends during the summer, almost every room in the city is occupied.

With renovation of the Rainbow Hotel and replacement of the Rendezvous Motor Inn, it is estimated that the stock of hotel/motel rooms in Great Falls will remain at its present level of about 1,600 rooms through the year 2000. If an increase in demand were anticipated, new units could be completed in about 4 months according to industry sources.

Average yearly vacancy rates for tent/recreational vehicle spaces are currently estimated at about 75 percent (170 recreational vehicle pads and 30 tent sites). During the peak season, June through early September, vacancies decrease to about 40 percent (90 recreational vehicle pads and 15 tent sites). With such high-average vacancy rates, no new facilities are projected. Should the demand increase substantially, recreational vehicle pads and tent sites could be developed very rapidly at both the Great Falls Kampground of America (KOA) and Dick's Trailer Park and Campground since the adjacent land is already zoned for campground use.

Malmstrom Air Force Base. Malmstrom AFB has 1,406 housing units (710 Capehart, 492 Wherry, 4 appropriated, and 200 "relocatable" modular homes on permanent foundations). This onbase housing consists of 216 four-bedroom, 902 three-bedroom, and 288 two-bedroom units. The family housing on Malmstrom AFB is currently 99.7 percent occupied. The existing use by rank and number of bedrooms is given in Table 3.1.3-4. An onbase mobile home area with capacity for 100 units exists for military personnel use. There are about 50 privately owned mobile homes located in this mobile home park, leaving room for an additional 50 units, though the current spacing of mobile homes is preferred. In addition, there are 40 units for temporary living quarters for inbound or outbound families.

Currently, Malmstrom AFB has the facilities to house 40 unaccompanied officers and 1,663 unaccompanied enlisted men. All unaccompanied dormitories are currently fully occupied. The renovation of three dormitories in 1987 and two additional facilities in

Table 3.1.3-3

Low-Income Housing in the City of Great Falls

Type and Name	Units	Eligibility
Private		
Section 8 New Construction[1]	**306**	
Aspen Village	60	Family
Broadview Manor	20	Family
Centennial	48	Family
Elmwoods	18	Family
Holiday West	48	Family
Rainbow	40	Elderly
Sunshine Village	72	Elderly
Section 8 Modification/Rehabilitation[1]	**260**	
Completed	200	Family
Under Construction	60	½ Family and ½ Elderly
Section 8 Existing[1]	**350**	
Run by Opportunities Inc.	300	All
Run by Great Falls Housing Authority	50	All
221-D3[2]	**312**	
Downtowner	111	Elderly[3]
Engles Manor	141	Elderly
Soroptomist	60	Elderly
236[4]	**312**	
Grandview	96	Family and Single
Parkview	84	Family and Handicapped
Vista Villa	132	Family and Handicapped
PRIVATE TOTAL:	1,540	
Public		
Austin Hall	34	Elderly and Handicapped
Palmdale	356	Family[5]
Russle	20	Family
Sunrise Courts	50	Family
Yeoman Tynes	30	Family and Handicapped
PUBLIC TOTAL:	490	
TOTAL:	2,030	

Notes: [1]Housing Assistance Payments Program for Lower-Income Families.
[2]Mortgage Insurance-Rental and Cooperative Housing for Low and Moderate Income Families (Market Rate).
[3]Residents must pay for 2 meals a day.
[4]Interest Reduction Payments Rental and Cooperative Housing for Lower-Income Families.
[5]Upgrading 116 units this year.

Source: Great Falls Housing Authority 1987.

Table 3.1.3-4

Size Distribution of Military Family Housing by Rank
Malmstrom AFB
1986

Rank	2 Bdrm	3 Bdrm	4 Bdrm	Total
Senior Grade	0	0	10	10
Field Grade	0	12	24	36
Company Grade	0	152	60	212
Senior Enlisted	0	122	32	154
Junior Enlisted[1]	288	616	90	994
TOTAL:	288	902	216	1,406

Note: [1]Including E-1s through E-4s with less than 4 years of service.
Source: U.S. Air Force 1986b.

1988 will reduce the personnel capacity of these quarters by 200. Transient quarters include space for 40 officers and 48 enlisted personnel.

City of Lewistown.

Permanent Units. Permanent year-round units in the City of Lewistown in 1980 were reported at 2,935 by the U.S. Bureau of the Census. Of these, 1,927 (65.7%) were owner-occupied, 789 (26.9%) were renter-occupied, and 219 (7.4%) were vacant. Approximately 22 units were identified as vacant "for sale only," 94 units "for rent," and 103 units were identified as "other vacant." Local realtors and housing officials support the census estimates as describing the current housing stock in Lewistown accurately.

Temporary Units. The temporary housing stock in the City of Lewistown includes hotel/motel rooms and tent/recreational vehicles spaces. In the late 1970s, during the Minuteman upgrade, all hotel/motel rooms and trailer spaces were occupied. The local Airport Authority allowed trailers to park at the airport, an arrangement that local officials feel can probably be repeated if necessary. Since 1980, a total of 30 hotel/motel rooms have been added, increasing the local stock to 286 rooms. Average vacancy rates in these facilities are about 45 percent (129 rooms). Between June and November, these rates fall to between 10 and 15 percent (35 rooms). It is not unusual for every room in Lewistown to be occupied during the summer and fall weekends. Currently, there are no future plans to add rooms to the local accommodations.

There are three private campgrounds in Lewistown: Green Acres Mobile Home Park (10 recreational vehicle pads), the Parkview Trailer Court (20 recreational vehicle pads and 20 tent spaces), and Mountain Acres Mobile Home Park (16 recreational vehicle pads). The peak season for the campgrounds is June through November when the vacancy rate is at about 10 percent (about 5 recreational vehicle pads and a few tent spaces). The year-round, average vacancy rate runs about 60 percent (16 recreational vehicles and 17 tent sites). There are no plans to add to this capacity.

Currently, Mountain Acres has about 100 mobile homes pads which could be occupied by recreational vehicles on a temporary basis. The number of vacant pads will probably increase unless the economic situation in Lewistown improves.

City of Conrad.

Permanent Units. Permanent year-round housing in the City of Conrad was enumerated in 1980 by the U.S. Bureau of the Census at 1,291 units. Of these, 773 (59.9%) were owner-occupied, 374 (29.0%) were renter-occupied, and 144 (11.1%) were identified as being vacant. Twenty-three of these vacant units were "for sale only," 88 were "for rent," and 33 were identified as being "other vacant." Since 1980, 29 new homes and 13 new mobile homes have been added to the housing stock in the City of Conrad bringing the total number of year-round units to 1,333 in 1986. Local realtors have estimated vacancies at 5 units (0.4%) for sale and 24 units (1.8%) for rent.

Temporary Units. The temporary housing stock in the City of Conrad in 1986 was estimated at 115 hotel/motel rooms and 75 existing mobile home spaces which could be used to park recreational vehicles. Conrad has no private campgrounds. The hotel/motel units include a new 50-unit motel. The remaining hotel/motel rooms are over 10 years old. Average vacancy rates in Conrad run about 40 percent (45 rooms). This rate decreases to about 10 percent (12 rooms) in the summer as a result of tourists traveling Interstate 15. There are no plans to build new hotel/motel facilities in Conrad.

3.1.3.4 Education

City of Great Falls. The Great Falls Public Schools (GFPS) system has a tradition of neighborhood elementary schools which minimizes busing of pupils in grades Kindergarten (K) through 6. The GFPS system also has an outstanding reputation for scholastic achievement and services such as programs in special education and in educational enrichment opportunities. The pupil-to-teacher ratio has been well below the state maximum standards for the past several years.

The GFPS system consists of two districts: District No. 1, an elementary school district (K-8), and District A, a high school district (9-12). The total GFPS system enrollment declined from 16,579 students in 1976-77 to 12,193 students in 1986-87. Of the total enrollment in 1986-87, 450 were full-time special education students (see Table 3.1.3-5). There were 545 regular classroom teachers with an overall pupil-to-teacher ratio of 22-to-1 broken down as: 23-to-1 ratio of students to teachers for elementary schools (K-6), 19-to-1 for junior high schools (7-8), and 20-to-1 for senior high schools (9-12). The GFPS system operates 15 elementary schools, 2 junior high schools, 2 high schools, a special education center, an adult education/alternative program center, and a vocational-technical center. In addition, three vacant school buildings have been maintained: Lowell Elementary School, Russell Elementary School, and Paris Gibson Junior High School. The design capacity of the vacant elementary schools is approximately 800 students, and capacity of the vacant junior high school is approximately 1,100 students. In 1970, the GFPS system total enrollment peaked at 19,649 students with 21 elementary schools, 3 junior high schools, and 2 senior high schools operational. The GFPS system owns 81 buses, which includes 52 regular buses, 14 special education buses, 11 spare buses, 2 environmental education buses, and 2 Easter Seal Society buses.

The number of regular classroom students in the GFPS system are projected at 12,176 in 1990; 12,666 in 1995; and 12,827 in the year 2000 (see Table 3.1.3-5). The projections include about 300 students expected to enroll as a result of the KC-135R air

Table 3.1.3-5

Great Falls Public Schools Historical Enrollments 1976-1986
and Projected Enrollment 1987-2000 by Grade Levels

Historical Enrollments	1976-77	1977-78	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87
Elementary	7,910	7,753	7,356	6,681	6,540	6,467	6,389	6,440	6,407	6,481	6,603
Jr. High	4,262	4,092	3,593	3,196	2,993	2,907	2,812	2,836	2,817	1,732	1,582
Sr. High	4,407	4,299	3,905	3,684	3,382	3,057	2,892	2,765	2,708	3,595	3,558
Subtotal	16,579	16,144	14,854	13,561	12,915	12,431	12,093	12,041	11,932	11,808	11,743
Special Ed	---	---	---	---	---	334	323	345	324	351	450
TOTAL:	16,579	16,144	14,854	13,561	12,915	12,765	12,416	12,386	12,256	12,159	12,193

Projected Enrollments	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-01
Elementary	6,736	6,983	7,032	7,185	7,285	7,343	7,330	7,311	7,335	7,354	7,354	7,354	7,354	7,354
Jr. High	1,645	1,758	1,791	1,814	1,781	1,773	1,886	1,962	1,924	1,886	1,909	1,928	1,928	1,928
Sr. High	3,373	3,277	3,202	3,177	3,266	3,333	3,332	3,328	3,407	3,474	3,539	3,569	3,560	3,545
Subtotal	11,754	12,018	12,025	12,176	12,332	12,449	12,548	12,601	12,666	12,714	12,802	12,851	12,842	12,827
Special Ed	473	473	473	473	473	473	473	473	473	473	473	473	473	473
TOTAL:	12,227	12,491	12,498	12,649	12,805	12,922	13,021	13,074	13,139	13,187	13,275	13,324	13,315	13,300

Note: The Senior High School enrollments included grades 10-12 prior to 1985-86 and grades 9-12 beginning in 1985-86. Junior High School enrollments included grades 7-9 prior to 1985-86 and grades 7-8 beginning in 1985-86.

Source: GFPS enrollment reports and demographic study projections.

refueling mission at Malmstrom AFB. It is anticipated that the number of special education students will stabilize at around 470, that the pupil-to-teacher ratio will increase to an overall ratio of 23-to-1 (which is below the state maximum standard), and that the number of certified teachers will increase to approximately 590. The existing facilities and the vacant facilities should be adequate to accommodate the projected increased baseline enrollment.

There are five private schools in Great Falls with a total enrollment of approximately 600 students. Two additional private schools have closed recently, but the buildings are well maintained and are used for various functions. There are currently about 14 empty classrooms. The private school enrollments are expected to remain stable over the next few years. The Montana State School for the Deaf and Blind is also located in Great Falls and is available for any Montana resident age 21 years or younger who is educationally disadvantaged because of sight or hearing loss.

The College of Great Falls is a 4-year, co-educational, Catholic college, with an enrollment of approximately 1,150 students. The College of Great Falls offers full degree-completion programs at Malmstrom AFB. Some students at the Malmstrom AFB Education Center choose to use Telecom from the College of Great Falls. Telecom is an educational delivery system which combines video-taped instruction with telephonic discussion in such a way that both audio and visual elements can be transported considerable distances. It is possible that the Telecom outreach educational program will be used at the launch control facilities enabling military personnel to take coursework. In addition to degree programs offered by the College of Great Falls at the Malmstrom AFB Education Center, two other universities offer coursework: Northern Montana College and the University of Southern California. The enrollments at the College of Great Falls are anticipated to increase in the next few years.

City of Lewistown. The Lewistown Public Schools offer a comprehensive curriculum including a gifted and talented program and special education program. The pupil-to-teacher ratios have been well below the state standards of an overall average of 28-to-1 and the staff is committed to providing quality education to the local students.

The Lewistown Public School system consists of two school districts: Elementary District No. 1 (K-8) and High School District No. 1 (9-12). It includes three elementary schools (K-6), a junior high school (7-8), and a senior high school (9-12). The total design capacity of these facilities is 2,200 students. There are 102 certified teaching staff members and 68 noncertified teaching staff members, with a 1986-87 enrollment of 1,631 students from a 25-square-mile (sq mi) area. The school system also provides specialized instructional services and adult education. The average pupil-to-teacher ratio was 20-to-1 for K through 8 enrollments, and 18-to-1 for 9 through 12 enrollments. In the 1970s, the enrollment was over 2,000 students. The school system has 14 buses, including 9 route buses, 3 spare buses, and 2 activity coaches.

Between the 1985-86 and 1986-87 school years, Lewistown Public School enrollments increased by 115 students due largely to the closing of St. Leo's Catholic School. The projected enrollment for the two Lewistown school districts is expected to remain at the 1986-87 levels, or slightly decrease. Consequently, the projected staff and facility needs will not increase over the current situation.

City of Conrad. The Conrad Public Schools offer quality basic education programs and programs for students with special needs. The pupil-to-teacher ratios have been well below the state maximum standards of an average of 28-to-1 for the past several years.

The Conrad Public Schools system consists of two school districts: Elementary District No. 10 (K-8) and High School District No. 10 (9-12). In the 1986-87 school year, a total of 742 students were enrolled in two elementary schools (K-5), one middle school (6-8), and one high school (9-12), with 70 certified teaching staff members. The pupil-to-teacher ratios in the two Conrad school districts are 14-to-1 for grades K through 8, and 11-to-1 for grades 9 through 12. In 1976, the Conrad Public Schools enrollment peaked at 1,734 students, with pupil-to-teacher ratios of 23-to-1 for elementary and 21-to-1 for secondary levels. The Conrad school districts own 12 relatively new buses, including 8 route buses, 2 activity buses, and 2 spare buses. Conrad Christian School, west of Conrad, has an enrollment of about 20 students.

The enrollments at the Conrad school districts are expected to remain at the 1986-87 levels with the exception of an increase of approximately 20 to 40 students expected in 1988 as a result of an Air Force Strategic Training Range installation locating in Conrad.

3.1.3.5 Public Services

City of Great Falls. The City of Great Falls has a commission/city manager form of government, with five commissioners serving as elected officials, one of whom acts as mayor. In 1986, the City of Great Falls employed 406 persons in 16 departments which was about 20 fewer than the corresponding number of staff in the late 1970s. The major employment categories were police (87), fire (73), public works (102), recreation (26), community development (28), and libraries (39). Some of the major departments potentially affected by the program are discussed in detail. By 1999, city government employment is projected to reach 421 personnel including 4 additional positions in both police and personnel, and a gain of 2 staff in recreation, community development, and libraries.

Police. As of March 1987, the Great Falls Police Department had 63 sworn officers and 22 other administrative personnel. From 1972 to 1974, the department had 75 sworn officers but they did not devote as much time to patrols as they do today, because under the present system, dispatching and jailing duties are performed by the administrative personnel, thereby allowing sworn officers to devote more time to patrol duties. Parking meter collection and enforcement have been contracted to a private firm. The department responded to about 21,000 calls for service in 1986. The number of personnel can be expected to increase slightly in the future to accommodate the increase in population.

The department has 33 vehicles, 20 of which are patrol cars and 8 are detective units. In August 1982, the department implemented a vehicle utilization program. This program called for the purchase of seven new vehicles per year. These cars will be used for 3 years, 2 years of primary use and 1 year of secondary use, after which the cars will be used as detective patrols or sold to another city department.

The police department along with the Cascade County Sheriff's Department are involved in Crime Stoppers, Neighborhood Watch and drug team operations.

The Great Falls Police Headquarters houses a records and communications area, a detention center, intelligence and training facilities, as well as administrative offices. The city detention facility dates back to 1975 and has the capacity for 19 people (15 male and 4 female). It has a current daily occupancy of 15 to 17 prisoners. This facility is expected to approach capacity with future increase in population.

Fire. The Great Falls Fire Department provides service to the incorporated part of the city. In addition to serving the City of Great Falls, the department has contracts with 15 neighboring communities, and mutual-aid agreements with Malmstrom AFB, the Montana Air National Guard, and the Black Eagle Volunteer Fire Department. As of January 1987, the Great Falls Fire Department had 68 firefighters and 4 administrative personnel. The department responded to 1,100 alarms in 1986, a 34-percent reduction from the 1983 level. Current staffing levels (3 men per pumper at 4 station houses) are expected to meet the needs of the community in the future unless housing expansion occurs some distance from current station houses. The fire district the department serves has a Class 2 overall fire-insurance rating (with a Class 2 being the highest level of service).

The Great Falls Fire Department has four fire stations and one fire-training center. These structures are fairly modern; all of them were built in the early 1970s. The facilities are in good condition and are expected to have a 50-year life span. These facilities were designed to handle a population up to 80,000; therefore, no need for additional facilities is foreseen. Unless new housing is concentrated some distance from existing station houses, station houses are situated such that the response time is between 1.5 and 3 minutes. The fire-training center, the only one of its kind in Montana, is used for training and instructional purposes. If the need arises, the fire-training facility, located southwest of Malmstrom AFB, could be converted into another fire station.

The department's inventory of front-line equipment consists of three 1,250-gallons per minute (gpm) pumpers (1971), one 1,000-gpm pumper (1980), one 1,250-gpm 85-foot boom snorkel (1970), and one battalion chief car (1984). Front-line equipment has a 20-year life span. The existing front-line equipment will need to be replaced in the early 1990s to maintain the current level of service. A bond issue may be proposed to facilitate the purchase. The department also maintains equipment for second-line use as well as a number of specialty units (boat, resuscitation unit, etc.).

Cascade County. In 1986, Cascade County employed an average of 587 people in 45 departments, which is representative of the last 10 years. The major decreases in county employment during this period were in the Surveyor Department (roads and bridges), which experienced a loss of approximately 35 persons 5 years ago; the employment of Comprehensive Employment Training Act (CETA) workers in the late 1970s; and the employment of Youth Employment Act workers for summer employment in the late 1970s. During the summer months, there are seasonal increases in employment due largely to the Montana State Fair. The departments with the most employees are the Cascade County Nursing Home (224), Surveyor Department (72), Sheriff's Department (53), and Treasurer's Department (25). Considering projected population increases and in order to maintain existing service levels, Cascade County would have to hire an additional 14 personnel by 1999.

Sheriff. As of January 1987, the Cascade County Sheriff's Department had 34 sworn officers among a total of 50 personnel. Staffing can be expected to increase slightly in the future as the population increases. Even if the majority of this population settles in the City of Great Falls, demands will be placed on the Sheriff's Department because of its operation and administration of the jail, drug team, Coroner's Office, and traffic safety responsibilities. The Sheriff's Department currently has 63 vehicles, with 38 operational. Four new vehicles were recently purchased and additional funding to purchase approximately ten more is being sought. The sheriff expects to have approximately 40 vehicles after the new purchases and the attrition of older vehicles. The Sheriff's Posse, responsible for search and rescue operations in the surrounding areas, is staffed by 26 volunteers.

The county jail, built in 1914, is currently overcrowded. Two recent attempts to fund a new facility were unsuccessful. The jail has been housing between 55 and 65 prisoners exceeding its design capacity of 42 to 45. Current jail facilities are inadequate and the situation will deteriorate in the future with projected baseline population increases including additional military population from the KC-135R air refueling program. This situation has caused the process of law enforcement to become more difficult increasing public safety risks.

Fire. In 1986, the Cascade County Rural Fire Council consisted of one salaried fire chief funded from the budget of the Cascade County Sheriff's Department. The council is made up of 15 rural fire stations that are staffed by volunteers. The total number of volunteers is between 200 and 300 people. Given the nature of historic service levels in these rural areas, the current staffing will be able to meet the future needs of the area. The majority of the rural areas served by the council has a Class 10 fire-insurance rating.

Central dispatching is done through the Cascade County Sheriff's Department. Fifty percent of the volunteer personnel are on a paging system while the remainder are contacted by telephone. The council responded to 200 calls in 1986, a fairly light load historically. The usual average is between 180 and 250 calls per year. Sixty-five percent of these calls are related to brush/forest fires. The council has mutual-aid agreements with the Malmstrom AFB and the Montana Air National Guard Fire Department.

The council currently has 69 vehicles; 33 are county-owned, 8 are owned by the Montana Forest Department (with whom they have a cooperative arrangement), and the remainder are locally owned. These vehicles include 14 pumpers (one 750 gpm and thirteen 500 gpm) and 9 water tenders (700-3,000 gallon capacity). The average age of the vehicles is 22 years and approximately 80 percent of them have been built from ex-military chassis acquired from Malmstrom AFB. The age of the existing vehicles has been a concern, and due to a lack of funding this problem will remain. The number of vehicles in use will be able to meet future needs for the limited protection that has been historically available in these rural areas.

Health. The City-County Public Health Department offers public and environmental health programs. There are 30 full-time employees whose mission is to emphasize preventative approaches to good health. Among the services offered are preschool exams, health screening, women/infant/children (WIC) education programs, immunization clinics, communicable disease control, septic system permits, and an air pollution control program. Currently, the immunization program is operating at capacity and the WIC program, a U.S. Department of Agriculture funded program, has a 4-month waiting list; many Malmstrom AFB personnel use this program. It is anticipated that the City-County Public Health Department services will continue as in the past, provided there is funding to support the services.

The Golden Triangle Mental Health Center maintains eight offices offering psychiatric and psychological services to an eight-county area in north-central Montana. The Cascade County office accounted for between 60 and 70 percent of the total number of cases served over the past 10 years. The total full-time equivalent (FTE) staff has been approximately 65 for the same period, except for additional staff in 1980 to 1982 associated with an adolescent treatment program. It is estimated that 14 percent of the population uses family and personal counseling services; this percentage is expected to apply to Cascade County in the near future.

Human Services. The Cascade County Office of Human Services handles public assistance programs including aid to families with dependent children, food stamps, medical assistance, and low-income energy assistance program (LIEAP). With the exception of LIEAP, which experienced a slight decrease in the number of cases, all programs showed an increase in the number of cases from 1985 to 1986. There are now 72 employees, which is an increase of about 10 from 1975. However, in the last 3 years, the workload has increased substantially but staffing has not increased proportionately. About 20 percent of the funding for the program in the past has been from the state, but in recent years, the state has not met this percentage contribution and is not expected to in the near future.

Services Provided by Private Agencies.

Health and Hospitals. The medical community in the City of Great Falls includes two major facilities: Columbus Hospital, a 199-bed facility; and Montana Deaconess Medical Center, a 288-bed facility.

Columbus Hospital employed a total of 647 FTE employees in 1986, up from 500 in 1976. During the same period, the corresponding number of patient days declined from 51,001 to 36,301, while the number of outpatient visits increased from 32,175 to 39,950. The latter reflects a health care trend to treat patients on outpatient visits rather than hospitalization, when possible. The current occupancy rate is 50 percent, compared to the 11-year peak of 78 percent in 1979. Montana Deaconess Medical Center employed a total of 951 FTE employees in 1986, up from 625 in 1976. The corresponding number of patient days was 56,909 in 1986 and 63,923 in 1976. However, the number of outpatient visits has increased from 18,887 in 1982 to 22,835 in 1986. This trend is expected to continue, and is explained by the change in occupancy rate which was 54 percent in 1986 compared to the 11-year peak of 66 percent in 1976.

In addition to the regional medical centers, three nursing homes in Great Falls (Cascade County Nursing Home, Montana Deaconess Skilled Nursing Center, and Park Place Health Care Center) have a total of 568 licensed beds with 100-percent occupancy. It is likely that facility expansion will be needed for these nursing homes, especially since the Great Falls population is projected to include more elderly.

Columbus and Montana Deaconess hospitals plan to accommodate the Malmstrom AFB Hospital referrals, and have no plans for major expansion in the future. The Malmstrom AFB Hospital is a 20-bed unit that is scheduled to be replaced in 1988 by a new Air Force Comprehensive Health Care Center.

Emergency Services. Bicsak Ambulance serves the Great Falls area, and in 1986 it had a staff of 15 and 4 vehicles. They have four crewmen on duty at all times manning two vehicles. In the last 4 years, the calls for service have averaged approximately ten per day. In 1979, calls for service peaked at 12 per day.

In addition to ambulance service, Great Falls has the North Central Mercy Flight, an emergency air service that has been in operation for 5 years. This regional ambulance service is operated jointly by Montana Deaconess Medical Center and Columbus Hospital as an extension of each hospital's emergency department. This service is available on a 24-hour basis and is headquartered at alternating hospitals for 2-week periods. The helicopter has a 350-mile range and can reach all portions of Cascade County and parts of seven other counties within 30 minutes. While in transport, the helicopter carries a pilot, a registered nurse, and an emergency medical technician.

In 1986, the North Central Mercy Flight averaged about one call per day. Seventy percent of these calls were for scheduled transfers from smaller hospitals. The other 30 percent are accident-related calls. The current level of staff, vehicles, and facilities for the ground and air emergency services should meet the needs of the community in the future.

Human Services. Around 175 nonprofit community support groups provide emergency services (food and shelter), support, and information or referrals in the Great Falls area. The categories of services include alcohol treatment, youth-related programs, counseling, drug rehabilitation, emergency services, financial aid, handicapped, housing information and referrals, military/veterans, senior citizens, social groups/activities, volunteer programs, and welfare. The following private organizations have been included as major representative agencies in the Great Falls area: the Great Falls Community Help Line, Opportunities, Inc., and the Salvation Army.

The Great Falls Community Help Line operates a 24-hour telephone service for persons in the community involved in an emotional crisis or in need of information about human service agencies. The total number of calls during 1986 was 13,830 and is expected to increase slightly as the different agencies expand their programs. Over half of the total number of calls were regarding the Mercy Home, which is a temporary emergency shelter for abused, battered, and transient women and children.

Opportunities, Inc. is a nonprofit community action group that helps people make a transition from public assistance to self-sufficiency. The agency employs 20 full-time and 25 part-time employees, and relies on volunteer time to assist with the various programs. Opportunities, Inc. handles the Federal government commodity programs for distribution of food (cheese, butter, rice, flour, honey, etc.) to needy families when the commodities are available, and also makes housing referrals. The services offered by Opportunities, Inc. are a function of funding, which is projected to remain stable.

The Salvation Army runs three programs: Outreach (food and shelter), Thrift Store, and Youth and Family Center. In 1986, a total of 20 FTE employees staff the agency, with additional volunteer workers and general assistance workers. The paid staff is ten FTE fewer than 1 year ago because of budget cuts. The shelter capacity is 50 persons, including three family rooms, and it has a 40-percent occupancy rate; this rate is higher in the winter. Approximately 70 persons are served meals each day. However, there is the capacity to serve meals to up to 400 people per day, but the funding is not available.

City of Lewistown. In 1986, there were 165 employees in local government administration. There are 14 city departments. No change in city personnel is expected over the study period. A description of fire and police are given because of their expressed importance to the community and relatively large staffing and budgetary needs.

Police. The Lewistown Police Department consists of 11 officers and 4 civilians. The staffing at the department has remained fairly stable over the last 15 years. The Department leases three vehicles which are replaced each year. The Lewistown Police Department responded to 4,240 calls in 1985, and has averaged 3,063 calls over the last 10 years. The city and county share a jail facility. The jail can handle 39 prisoners and has a current average daily population of 3 prisoners.

The department has an active Crimestoppers program, as well as child identification and Neighborhood Watch programs. These were instituted in 1983 and require approximately 8 hours of officer time each month. The current staffing, vehicles, and facilities for the department should be adequate to meet the needs of the community in the future.

Emergency services for the city and parts of Fergus County are provided by the Lewistown Police Department. Lewistown has 15 trained (state and federally certified) technicians who man two emergency vehicles. These technicians work as paid volunteers. They average about one call per day. The current staffing, vehicles, and facilities for the emergency services should be adequate to meet the needs of the community in the future.

Fire. The Lewistown Fire Department is staffed by 7 paid firefighters, 3 administrative officers, and 18 part-time firefighters. The department services an area encompassing 85 sq mi. The fire station is located in the City Complex, which was constructed in 1981, and is equipped with two 1,000-gpm pumpers (1968 and 1976) and one 65-foot snorkel pumper (1974). In addition, the rural district has a 750-gpm pumper (1985) which is located in the City Complex. The city has a Class 4 fire-insurance rating. In 1986, the department responded to 136 calls for service: 116 inside the city limits and 20 from the surrounding rural areas. Over the last 8 years, the department has averaged 156 calls: 126 in the city and 30 in the rural areas. The current staffing, vehicles, and facilities should be sufficient to meet the needs of the community in the future.

Fergus County. Fergus County employs 68 full-time and 32 part-time employees and has 24 departments. The Roads Department is the largest with 20 people. No change in county personnel is expected over the study period. The Sheriff's Department and health and hospitals were analyzed further due to their expressed importance to the community.

Sheriff. The Fergus County Sheriff's Department currently has eight employees, consisting of six deputies, one sheriff, and one undersheriff. The county owns one patrol car and leases seven other vehicles. The leased vehicles are replaced every 25,000 miles. The Fergus County jail was constructed in 1976 and is located in the same structure as the Sheriff's Department. It has a capacity for 39 prisoners, with sections for men, women, and juveniles. The jail's population has been averaging about three per day. The Fergus County Sheriff's Department received 17,432 radio calls in 1985. The average number of radio calls received over the last 9 years has been 22,344, with the highest number received in 1978 at 26,792. The current level of staff, vehicles, and facilities will meet the needs of the community in the future.

Health and Hospitals. The Central Montana Hospital in Lewistown has 47 licensed beds with an average daily census of 19 patients. The total inpatient days for 1985 was 6,750. The Central Montana Nursing Home has 70 licensed beds and the Vale Vista Manor in Lewistown has 95 licensed beds for long-term care.

City of Conrad. The City of Conrad employs 33 people in eight departments. No change in city personnel is expected over the study period. A description of the Conrad Fire and Police departments is given because of their expressed importance to the community and relatively large budgetary needs.

Police. In 1986, the Conrad Police Department was staffed by five officers. Prior to 1975, the department had three officers and the police chief. Since 1975, they have maintained the current level of staffing. Currently, the department has two vehicles and responds to an average of 120 calls per month. Most arrests in the area were made for driving while under the influence, shoplifting, and vandalism. The City of Conrad had 18 incidents of Part I (felony) crime in 1985. The highest year for incidents of Part I crimes was in 1979 when 64 were reported. The Air Force has contracted with the city for police services necessary for the Air Force Strategic Training Range installation in Conrad.

The jail population has averaged two to three prisoners per day. A new jail facility, which will be shared with the county, is planned to open in the near future. The current level of staff, vehicles, and facilities should meet the future needs of the community.

Fire. The Conrad Fire Department serves the city and parts of the surrounding rural areas. The department has an all volunteer staff. Over the last 10 years, they have had an average of 23 to 24 volunteers; currently they have 22. The department has averaged 15 city calls annually and 23 rural calls since 1975. In 1986, the department responded to 9 city calls and 17 rural calls. The city has a Class 5 fire-insurance rating while the majority of the surrounding rural areas have a Class 10 fire-insurance rating. The department has two vehicles, one 750-gpm pumper (1956) and one 1,000-gpm pumper (1975). The rural areas have an additional 750-gpm pumper (1971). These vehicles are housed in the City Complex in Conrad. The current level of staffing, vehicles, and facilities should be able to meet the future needs of the community under baseline conditions.

Pondera County. Pondera County employs 100 full-time and 30 part-time employees in 20 departments. The Roads Department is the largest with 28 people, including summer employment. No change in county personnel is expected over the study period. The Sheriff's Department, health and hospitals, and emergency services were analyzed due to their expressed importance to the community.

Sheriff. The Pondera County Sheriff's Department has had the same number of personnel since 1975. These include five full-time officers including the sheriff, three part-time officers including the resident deputies in the outlying areas, three full-time dispatchers, two part-time/full-time dispatchers, and one full-time dispatcher/secretary. As of 1986, the department had seven vehicles. A new jail is being constructed in the City of Conrad as well as the installation of a 911 dispatch system, which will improve public safety services in Pondera County. Officials indicated that they may need additional personnel to operate the jail.

The jail averages 2 to 2.3 prisoners daily. The new jail, expected to be completed by the summer of 1987, will be able to hold approximately 16 prisoners. Pondera County reported 52 incidents of Part I crime in 1985. The peak year for Part I crime was 1980 when 77 incidents were reported. In 1985, Pondera County ranked number 42 out of 47 reporting counties in Montana for crime rates.

The current level of staffing (except for additional jailers), vehicles, and facilities will meet the future needs of the community.

Health and Hospitals. The Pondera Medical Center has 34 acute-care beds and 78 nursing home beds. The number of hospital-patient days in 1985 was 1,444 for the medical center, with an average daily census of four patients.

Pondera County Ambulance provides service to the county as well as nearby areas in Toole and Teton counties. This service is owned by the county but contracted out through the Pondera Medical Center. The county is responsible for purchasing the vehicles and contributes approximately 30 percent of the budget, the rest is covered by user fees. As of February 1987, this county hospital department had 20 personnel, 12 in Conrad and 8 in Valier. There are two people on duty 24 hours a day and in addition, two more serve as backups. These trained emergency medical technicians work as volunteers for a minimal wage. The company has three vehicles, two (1978, 1984) are stationed in Conrad and the other (1980) is stationed in Valier. The 1978 model will be replaced next

year. The company responds to an average of 250 to 275 calls per year. The majority of these calls are for traffic-related incidents. Dispatching is done through the Sheriff's Department. The current level of staffing and equipment should be adequate to meet the needs of this community in the future under baseline conditions.

3.1.3.6 Public Finance

The county governments in the ROI are organized under a commission form of government. The City of Great Falls has a commission-manager form of government while Conrad and Lewistown are organized under a council-mayor form. Local governments have only legislative, administrative, and other powers provided or implied by law. The state plays a key role in local-government affairs. State law dictates maximum mill-rate levies for the major functions of a jurisdiction. The State also operates 37 different programs that supplement local revenues available from property taxes and other sources.

Local governments in the ROI rely to a large extent upon local tax revenues to fund governmental operations. Tax revenues, principally in the form of property taxes, account for almost one-half of all governmental fund revenues in the cities and counties and slightly less for the school districts (25-50%). Public safety expenditures (law enforcement and fire protection services) generally account for the single largest categorical expenditure for the cities. General government administration costs (including the court system), and public works expenditures, principally road and street maintenance expenditures, generally account for the majority of county-level expenditures.

City of Great Falls. City revenues (general fund, special revenue, special assessment, debt service, and capital projects fund) were $17.6 million in fiscal year (FY) 1986 current dollar values (Table 3.1.3-6). Revenues have increased since FY 1983 when revenues amounted to $13.5 million. This represents a turnaround from the FY 1980 to 1983 period when revenue collections dropped from $15.9 million in FY 1980 to the FY 1983 level of $13.5 million. Tax revenues, including property taxes, accounted for almost one-half of these totals.

Expenditures over the FY 1980 to 1986 period have paralleled the fluctuations in revenues. Expenditures in FY 1980 were $13.3 million; these dropped to $12 million in FY 1983 and grew to $16.4 million by FY 1986. Expenditures for public safety functions (law enforcement and fire protection) accounted for the single largest expenditure category, approximately one-third of the total outlays over this period.

The city also maintains six enterprise funds, with the water and sewer fund being the largest. The water and sewer fund charged approximately $5.6 million against an operating revenue of $5.2 million in FY 1986.

Outstanding general obligation bond indebtedness consists of three issues, two of which are scheduled to mature in FY 1987 and FY 1989 and a third tax-increment bond scheduled to mature in FY 2005. Outstanding general obligation bond indebtedness is $2,440,000 as of FY 1986. This represents about 15 percent of the general obligation bonding capacity of the city. Revenue bond indebtedness consists of four issues, with an outstanding balance of approximately $20.7 million as of FY 1986.

In constant (1986) dollars, the decline in expenditures and revenues over the FY 1980 to 1983 period was 25 to 30 percent while the recent increases were in the 14 to 19-percent range.

Table 3.1.3-6

City of Great Falls Revenues and Expenditures
All Governmental Funds
FY 1980-2000
(millions $)

Fiscal Year	Current Dollars			Constant 1986 Dollars		
	Revenues	Expenditures	Net	Revenues	Expenditures	Net
1980	$15.9	$13.3	$2.6	$22.1	$18.5	$3.6
1981	16.5	15.9	0.6	21.2	20.4	0.8
1982	14.5	15.0	(0.5)	17.4	18.0	(0.6)
1983	13.5	12.0	1.5	15.4	13.8	1.6
1984	15.7	13.5	2.2	17.2	14.8	2.4
1985	16.0	14.5	1.5	16.6	15.0	1.6
1986	17.6	16.4	1.2	17.6	16.4	1.2
1990	24.1	24.1	0.0	22.0	22.0	0.0
1995	33.6	33.6	0.0	22.3	22.3	0.0
2000	45.8	45.8	0.0	22.6	22.6	0.0

Note: Governmental funds include general, special revenue, debt service, capital projects, and special assessment funds. Enterprise, trust, and internal service funds are excluded. Current dollar estimates of forecasted expenditures and revenues based upon average annual increases in price deflator for gross national product of 3.6 percent per year over the 1985-90 period; 5.5 percent per year over the 1990-95 period; and 6.1 percent per year over the 1995-2000 period.

Sources: Douglas Wilson and Company 1980; Junkermier et al. 1982; Montana Local Government Services Division 1984; Douglas Wilson and Company 1984; Council of Economic Advisors 1986; Data Resources Inc., 1987.

Property-tax collections, as a percent of the amount levied, have been dropping steadily since FY 1982. The percent of the levy collected during FY 1986 stood at 92 percent, down from 97 percent in FY 1982.

Taxable valuation of property in the city grew slowly from $48.9 million in 1970 to $60 million in 1985 (current dollar values). However, the 1986 reappraisal resulted in a reduction to approximately $53.7 million. Measured in constant (1986) dollar terms, taxable valuations dropped over 50 percent since 1970.

The fiscal picture for FY 1988 and beyond depends upon action taken by the Montana State Legislature in response to the passage of Initiative 105 (a property-tax freeze on selected property types and a requirement to replace the estimated revenue foregone by alternate revenue sources) and the health of the general economy both statewide and locally. Because of uncertainties in the Legislature's response to current tax reform issues, the fiscal actions necessary to balance the State's budget, and the loss of Federal revenue-sharing monies, revenues and expenditures through FY 1988 are expected to remain around the current levels. Based upon historical fiscal and population patterns and projected population and economic growth over the forecast period, revenues and expenditures are assumed to increase to approximately $22 million and stabilize at these levels through FY 2000 (Table 3.1.3-6).

Cascade County. Revenues of the county's governmental funds were $12.8 million in FY 1986 current dollar values (Table 3.1.3-7). Tax revenue (property and other miscellaneous taxes) and special assessments accounted for almost one-half of this total. Revenues have been decreasing substantially over recent years. By FY 1986, revenues had declined by 25 percent from the FY 1981 levels.

Expenditures have also been declining but at a slower rate than have revenues. Expenditures in FY 1981 were $15.9 million and by FY 1986 amounted to only $12.6 million. Outlays for public works and general government operations account for the majority of the total outlays of the county.

In constant (1986) dollars, the decline in revenues and expenditures has been approximately 40 percent over the FY 1981 to 1986 period.

The principal enterprise fund maintained by the county is for the Cascade County Nursing Home. In FY 1986, the nursing home registered $4.7 million in operating expenditures, $4.1 million in operating revenues, and an additional $425,000 in nonoperating revenues (taxes and intergovernmental aid). The county has no general obligation bond indebtedness.

Actual tax collections for FY 1986 were approximately 95 percent of the amount levied. Taxable valuation of property in the county has experienced a similar pattern of decline as in the city. In constant (1986) dollar terms, taxable valuation in the county has dropped approximately 50 percent since 1976. Unlike the city, however, the 1986 reappraisal resulted in a slight increase in 1986 valuations, from $91.6 million in 1985 to $92.2 million in 1986.

Similar to the City of Great Falls, the fiscal picture for FY 1988 and beyond depends upon action taken by the State Legislature in response to the passage of Initiative 105 and the health of the state and local economies. While the recent upturn in taxable valuation in the county appears to signal a turnaround in recent trends in the county's tax base, protested reappraisals, particularly by major property owners such as Montana

Table 3.1.3-7

Cascade County Revenues and Expenditures
All Governmental Funds
FY 1981-2000
(millions $)

Fiscal Year	Current Dollars			Constant 1986 Dollars		
	Revenues	Expenditures	Net	Revenues	Expenditures	Net
1981	$17.0	$15.9	$1.1	$21.9	$20.5	$1.4
1982	14.6	14.2	0.4	17.5	17.0	0.5
1983	14.0	15.4	(1.4)	16.1	17.7	(1.6)
1984	14.0	14.1	(0.1)	15.3	15.4	(0.1)
1985	14.1	13.4	0.7	14.6	13.8	0.8
1986	12.8	12.6	0.2	12.8	12.6	0.2
1990	13.4	13.4	0.0	11.6	11.6	0.0
1995	17.8	17.8	0.0	11.8	11.8	0.0
2000	24.1	24.1	0.0	11.9	11.9	0.0

Note: Governmental funds include general, special revenue, debt service, capital projects, and special assessment funds. Enterprise, trust, and internal service funds are excluded. Current dollar estimates of forecasted expenditures and revenues based upon average annual increases in price deflator for gross national product of 3.6 percent per year over the 1985-90 period; 5.5 percent per year over the 1990-95 period; and 6.1 percent per year over the 1995-2000 period.

Sources: Cascade County Clerk and Recorder 1981; Council of Economic Advisors 1986; Data Resources Inc., 1987.

Power Company and Burlington-Northern Railroad, leave the estimated tax collections for FY 1987 in doubt. If current trends continue, revenues and expenditures can expect to continue to decline through FY 1988. Any improvement in the county's fiscal position is assumed to be limited to a stabilization of revenues and expenditures at these lower levels.

Great Falls Public Schools. Budgeted general fund revenues and expenditures of the Great Falls Elementary School District No. 1 were $22.1 million in FY 1987 (current dollar values) and have grown from $15.1 million in FY 1980. Funding for local school districts consists principally of state contributions and local property taxes.

In constant (1986) dollars, expenditures and revenues have remained relatively stable at approximately $21 million and are assumed to increase slightly as enrollments increase (Table 3.1.3-8). General fund expenditures per pupil are approximately $2,500 per pupil.

The P.L. 81-874 Program provides federal funds to Great Falls school districts in areas affected by federal activities. Two basic classifications of these pupils are used: "A" students are those whose parents live on federal property (e.g., Malmstrom AFB) and "B" students are those whose parents work on federal property. Under the P.L. 81-874 Program, Elementary School District No. 1 received almost $400,000 in FY 1986. Federal-related enrollments in FY 1986 consisted of 820 regular "A" students, which resulted in $370,070 in contributions, and 1,235 regular "B" students, which resulted in $26,900 in contributions.

Elementary School District No. 1 also maintains six other funds, with the employee-retirement fund being the largest. The FY 1986 retirement budget was approximately $2.5 million.

Outstanding general obligation bond indebtedness consists of two issues that are scheduled to mature in 1988 and 1994. Outstanding general obligation bond indebtedness was $1,339,000 as of March 1986, representing about 4 percent of the bonding capacity of the district.

Budgeted general fund revenues and expenditures of the Great Falls High School District No. A were $13.5 million in FY 1987 and have increased from FY 1980 levels of $9.3 million. In constant (1986) dollars, revenues and expenditures have been relatively stable at approximately $13 million and are assumed to increase slightly as enrollments increase. General fund expenditures per pupil (enrollment based) are approximately $3,500 per pupil.

Under the P.L. 81-874 Program, High School District No. A received approximately $100,000 in FY 1986. Federal-related enrollments in FY 1986 consisted of 144 regular "A" students, which resulted in $88,400 in contributions, and 551 regular "B" students, which resulted in $12,800 in contributions.

High School District No. A also maintains seven other funds, with the teacher retirement fund ($1.4 million) and the post-secondary vocational education funds ($1.7 million) being the largest.

Outstanding general obligation bond indebtedness consists of four issues that are scheduled to mature over the 1988 to 1997 period. Outstanding general obligation bond indebtedness as of March 1986 amounted to $3,189,000, representing 9 percent of the bonding capacity of High School District No. A.

Table 3.1.3-8

Great Falls Public Schools
Budgeted General Fund Revenues and Expenditures
FY 1980-2000
(millions $)

Fiscal Year	Elementary School District No. 1		High School District No. A	
	Current	Constant 1986$	Current	Constant 1986$
1980	$15.1	$21.1	$ 9.3	$13.0
1981	16.0	20.6	9.9	12.7
1982	17.6	21.1	10.4	12.5
1983	18.6	21.3	11.3	13.0
1984	20.0	21.8	12.2	12.9
1985	20.7	21.4	12.5	13.0
1986	21.4	21.4	12.9	12.9
1987	22.1	21.4	13.5	13.1
1990	26.6	23.1	13.7	11.9
1995	36.4	24.2	18.5	12.3
2000	49.2	24.3	26.5	13.1

Note: Budgeted revenues, by definition, equal budgeted expenditures. Projections assume constant per pupil expenditure rate based upon FY 1987 budgeted revenues and expenditures and estimated school year 1986-87 regular and special education enrollments.

Sources: GFPS 1986b; Data Resources, Inc. 1987.

City of Lewistown. Lewistown governmental fund revenues and expenditures amounted to approximately $1.7 million in FY 1986 (current dollar values). Revenues have increased from $1.3 million since FY 1983 while expenditures have increased from $1.4 million. General obligation bond indebtedness consists of three issues with approximately $708,100 outstanding as of FY 1986, representing 50 percent of the city's general obligation bond capacity. Current tax collections for FY 1986 were 89.2 percent of the amount levied. In constant (1986) dollars, revenues and expenditures have remained fairly stable at approximately $1.7 million.

Fergus County. Fergus County governmental fund revenues and expenditures amounted to approximately $3 million in FY 1985 (current dollar values), up from approximately $2.7 million since FY 1983. The county has no general obligation bond indebtedness. In constant (1986) dollars, revenues and expenditures have remained fairly stable at approximately $3 million.

Lewistown Public Schools. Lewistown Elementary School District No. 1 budgeted revenues and expenditures for FY 1987 are approximately $2.7 million (current dollar values), up 1.3 percent from FY 1986 levels. Expenditures (enrollment based) per pupil were $2,300 in FY 1987. In constant (1986) dollars, total revenues and expenditures, as well as per pupil costs, have been declining steadily since FY 1983 when revenues and

expenditures amounted to $2.8 million and costs were approximately $2,500 per pupil. The district does not receive any P.L. 81-874 monies. The district will have retired their general obligation bond indebtedness of $10,000 as of FY 1987.

Lewistown High School District No. 1 budgeted revenues and expenditures in FY 1987 were $1.7 million (current dollar values), up 5.6 percent from FY 1986 levels. In constant (1986) dollars, the increase was 2.6 percent, which represents a reversal of steadily declining budget levels since FY 1983. Costs per pupil were $3,200 in FY 1987 and have been declining since FY 1983 when they amounted to $3,700 per pupil. The district has $4.6 million in general obligation bond indebtedness which is scheduled to be retired in FY 1999. This represents approximately 90 percent of the district's reserve-bonding capacity. The district does not receive any P.L. 81-874 monies.

City of Conrad. Conrad governmental fund revenues amounted to approximately $940,000 in FY 1986 (current dollar values), about equal to FY 1983 levels, but down from FY 1984 levels of $1.1 million and FY 1985 levels of $1 million. Expenditures have fluctuated between $750,000 and $850,000 over the same period. The city has no general obligation bond indebtedness.

Pondera County. Pondera County governmental fund revenues amounted to approximately $3.4 million in FY 1986 (current dollar values), up from $2.8 million in FY 1985. Expenditures were $3.7 million in FY 1986, up from $3 million from the previous year. General obligation bond indebtedness amounted to $99,000 as of FY 1986, representing 3.6 percent of the county's bonding capacity. Property taxes collected were 88 percent of the amount levied in FY 1986.

Conrad Public Schools. Conrad Elementary School District No. 10 budgeted revenues and expenditures for FY 1987 are $1.5 million (current dollar values), up 2.6 percent from FY 1986 levels. Costs per pupil in constant 1986 dollars remained stable at approximately $2,900. The district does not receive any P.L. 81-874 monies. The district has $396,000 in outstanding general obligation bond indebtedness as of FY 1986, representing about 6 percent of the district's bonding capacity.

Conrad High School District No. 10 budgeted revenues and expenditures for FY 1987 are $1 million (current dollar values), up 9.4 percent from FY 1986 levels. Costs per pupil in constant 1986 dollars rose from approximately $3,700 in FY 1986 to $4,150 in FY 1987. The district has no long-term general obligation bond indebtedness. The district does not receive any P.L. 81-874 monies.

Montana State Government. State government finances have been adversely affected by the recent statewide economic slowdown. The State of Montana general fund revenues and expenditures in FY 1987 (current dollar values) were estimated to be $396.7 million and $405.6 million, respectively, as of May 1985 (Table 3.1.3-9), resulting in an estimated shortfall of $8.9 million. The total budget deficit as of early 1987 is estimated by various sources at $20 to $30 million. General fund revenue shortfalls in 5 of the 6 years have been registered. Real growth in expenditures and revenues measured in constant (1986) dollars has reflected the performance of the statewide economy. General fund revenues have remained relatively flat over the FY 1982 to 1987 period, while expenditures have shown slightly more variation.

The state relies heavily on income taxes and various severance taxes. Coal and oil production taxes comprise the principal severance tax revenues. Approximately 34 percent of general fund revenues are estimated to be accounted for by personal income taxes in

Table 3.1.3-9

Montana State General Fund Revenues and Expenditures
FY 1982-1987
(millions $)

	Current Dollars			Constant 1986 Dollars		
Fiscal Year	Revenues	Expenditures	Net	Revenues	Expenditures	Net
1982	$320.1	$347.9	($27.8)	$383.8	$417.1	($33.3)
1983	$313.6	$332.6	($19.0)	$359.6	$381.4	($21.8)
1984	$330.3	$357.4	($27.1)	$360.6	$390.2	($29.6)
1985	$364.5	$380.4	($15.9)	$377.3	$393.8	($16.5)
1986 (est.)	$377.5	$360.5	$17.0	$377.5	$360.5	$17.0
1987 (est.)	$396.7	$405.6	($8.9)	$385.1	$393.8	($8.7)

Notes: Constant dollar estimates based upon implicit price deflator for State and local government purchases of goods and services. FY 1986 and FY 1987 values are estimates.

Source: Montana Tax Foundation 1986.

FY 1987. Another 12 percent is accounted for by coal and oil production taxes. In addition, interest from previous years coal tax collections amounted to $32.3 million, or about another 8 percent of total FY 1987 general fund revenues.

General fund expenditures for the state university system account for the single largest expenditure category, $165.7 million in the FY 1985 to 1987 biennium representing about 22 percent of FY 1985 to 1987 appropriations. Contributions to local public schools account for another 14 percent of expenditures. Social service expenditures account for the other principal service cost of the state, another 20 percent of expenditures.

The state is faced with continuing fiscal difficulties over the next 2 years (FY 1988-89). Total revenue shortfalls of $130 to $360 million have been estimated and expenditure reductions, new revenue generating mechanisms (implementation of a sales tax, income tax surcharges, as examples), and appropriating monies from various trust accounts are currently being considered to reduce the estimated deficits.

3.2 Utilities

The increased demand for utility services during the construction and operations phases of the Small Intercontinental Ballistic Missile (ICBM) program at Malmstrom Air Force Base (AFB) may affect the current service level of towns, counties, or private firms. The utilities most likely to be affected by the proposed program are potable water treatment and distribution, wastewater, solid waste, and energy utilities.

3.2.1 Resource Description

For the Legislative Environmental Impact Statement (LEIS) analysis the primary focus was the capacity and demands of the regional utility systems. For this Environmental Impact Statement (EIS) analysis, the same utilities are reviewed, but the current focus includes all issues that affect the performance of community and private systems that service the local area.

3.2.1.1 Potable Water Treatment and Distribution

The potable water treatment and distribution element considers the facilities that distribute water of a specific quality to meet municipal and industrial demands. The water supply system is used for diverting water from its natural state, treating it to a desired quality, storing it, and distributing it to final users.

3.2.1.2 Wastewater

The wastewater disposal system element considers the facilities that provide collection, treatment, and disposal of nonhazardous waterborne wastes generated by municipal and industrial users. The wastewater system includes collection, treatment, and disposal of wastewater generated within a defined service area.

3.2.1.3 Solid Waste

The solid waste element examines the facilities and systems that provide collection and disposal of solid waste products from municipal and commercial sources. Each system considered operates within a defined service area. The processing operations range from landfills to resource recovery systems. Solid waste includes a discussion of the disposal of hazardous wastes within the study area.

3.2.1.4 Energy Utilities

The energy utilities element includes electricity, natural gas (and other heating fuels), gasoline, and diesel fuel. These energy types account for the majority of energy consumed in the study area. The element includes a discussion of major energy generators and suppliers and associated transmission and distribution systems. Energy facilities include generating stations, transmission lines and pipelines, and regional and local distribution networks. Energy utilities element also identifies state and Air Force energy conservation programs. Major energy sources outside the study area are also included if appropriate.

3.2.2 General Analysis Methodology

3.2.2.1 Region of Influence

The Region of Influence (ROI) for the utilities resource is the geographic area where community utility service may be directly or indirectly affected by the proposed program. The demographic analysis (Section 3.1) identified the communities expected to have a notable population change. Based on this analysis and the data collected on the installation of the Minuteman system, the major population centers of Great Falls, Lewistown, and Conrad are the communities closest to potential worksites and are the focus of the utilities analysis.

Service area boundaries in these communities define the ROI for the potable water, wastewater, and solid waste elements. The ROI for the energy utilities element is defined by the service areas of those companies providing power and fuel to the communities and to Air Force facilities located in the deployment area. The ROI for the EIS has been reduced to these service areas from the countywide and regionwide contexts used in the LEIS. The reduction is a result of the LEIS analysis and the current program description which indicate a potential for localized effects.

3.2.2.2 Potable Water Treatment and Distribution

Municipal water systems potentially affected by the proposed program were contacted and a historical profile of their use was generated. When available, data for a 5-year period were collected to identify trends in the amount of water treated and distributed. Maximum daily demands and peak-hour demand data were collected in addition to average daily demands. If a breakdown of major water users was available, it was used in the development of per capita water rates for residential, industrial, and other water users. Potable water demands at Malmstrom AFB were analyzed separately and as part of the overall demand on the Great Falls system.

The data collected were used to evaluate current demands on the system and to perform the future baseline demand forecasts. In addition, these data helped evaluate the adequacy of existing treatment processes and the sizes of any additional facilities. The soundness of current distribution systems and any proposed improvements were reviewed along with the current maintenance program.

In addition to data on the performance of the treatment and distribution system, data on water rates, operation and maintenance budgets, and staffing levels were incorporated into this analysis.

3.2.2.3 Wastewater

Wastewater treatment facilities in each community affected by the proposed program were assessed as to their ability to process additional flows and continue to meet their discharge requirements. The analysis began with an assessment of the flows processed in the past 5 years. Data concerning the service area and number of customers assisted in developing per capita rates. These rates were used to forecast future wastewater flows, which were then compared to existing and future capacities. Wastewater facilities at Malmstrom AFB were analyzed separately and as part of the overall demand on the Great Falls system.

Of particular concern in Great Falls is the number of combined sanitary and storm sewers, which adds to the flow processed at the treatment plant. The city is currently separating and replacing these sewers. These improvements will reduce flows, particularly peak-summer flows, which are exceeding 300 percent of the average flow. To evaluate the progress of this program, flow data were reviewed taking into consideration the separation of sanitary and storm flows. Storm drainage systems are analyzed in Section 3.9, Water Resources.

In addition to data on the performance of the treatment and collection system, data on sewer rates, operation and maintenance budgets, and staffing levels were incorporated in this analysis.

3.2.2.4 Solid Waste

Individual solid waste facilities that may be affected by the proposed program were identified and evaluated. Average daily disposal rates were developed through communication with each facilities' owners and operators. If this information was not available, disposal volumes were calculated using an equation that takes into account the per capita rates, cover requirements, and compaction ratios. Based on this information, the capacity of the existing disposal sites was calculated and the lifespan of the facilities identified. Waste generation at Malmstrom AFB was assessed separately and as part of the overall demand on the local system.

For each facility or system, current operating costs were obtained in terms of their collection and disposal rates. Staffing levels and operations and maintenance budgets were analyzed. Proposed facility expansions or equipment and staffing additions were noted as part of the baseline analysis.

Hazardous waste treatment, storage, and disposal facilities within the ROI were identified and the characteristics of the facility were recorded. Known hazardous waste sites were identified and the data were provided to the water resources group so that the potential effect on surface and groundwater resources could be assessed.

3.2.2.5 Energy Utilities

Major utilities companies that provide electricity and natural gas, along with local suppliers of liquid fuels and other alternative energy sources, were included in the study. For electricity and natural gas suppliers (and, to some extent, liquid fuel distributors), the service area of the supplier extended beyond the ROI identified for the potable water, wastewater, and solid waste elements. Energy consumption at the base and the outlying facilities was assessed separately. Energy resources were evaluated in terms of historical use and price. Energy use identified per capita annual consumption of electricity (in kilowatt-hours [kWh]), natural gas (in thousand cubic feet [Mcf]), and gasoline and diesel fuel (in gallons).

Unit costs for these energy forms were obtained from the suppliers or derived from average annual customer costs. Information on consumption and cost was obtained from energy utility suppliers in the ROI and federal energy data reports were used to verify these data.

Each energy service was analyzed to determine existing capacities and the ability to meet demands, as well as the nature of the systems, their size, extent and existing conditions, and frequency of energy interruptions and system disturbances. This portion of the

analysis included a description of the capacities and reserve margins of electrical-generating systems, natural gas reserves, liquid fuel supply contract quantities, and in addition, facilities plans, energy conservation programs, and use of nonrenewable energy resources.

3.2.3 Existing and Future Baseline Conditions

3.2.3.1 Potable Water Treatment and Distribution

Water treatment and distribution data for the systems servicing cities within the ROI are identified in Table 3.2.3-1. These systems are currently providing adequate service to their customers and do not anticipate any difficulties in meeting future demands.

City of Great Falls. The City of Great Falls provides potable water to approximately 64,600 persons, including Malmstrom AFB. The existing daily demands, met with diversions from the Missouri River, average 11.63 million gallons per day (MGD). In 1985, maximum daily peak demand was 39.85 MGD and minimum daily use was 5.05 MGD. A water treatment facility, with a capacity of 48 MGD, provides clarification and filtration. The distribution system consists of 5 pumping stations and 11 storage tanks with a capacity of 15.7 MGD. The location of the water system facilities, and other major utility installations in Great Falls, are identified in Figure 3.2.3-1.

The service population for the Great Falls water system will increase to 66,800 persons by 1990 and to 68,300 persons in the year 2000. Average daily potable water requirements are expected to increase to 12.24 MGD in 1990 and to 12.51 MGD by the year 2000. Adequate capacity will be available by the year 2000, with the plant operating at 26 percent of capacity.

Table 3.2.3-1

Water Treatment and Distribution Information for Communities in the Region of Influence

Community	1986 Service Population	Average Demand (MGD)	Peak Demand (MGD)	Storage Capacity (MG)	Surface Water Treatment Capacity (MGD)
Great Falls	64,600	11.63	39.8	15.7	48
Malmstrom AFB	6,200[1]	1.14	1.5	2.8	3.37[2]
Lewistown	7,100	1.8	3.1	1.35	6.9[3]
Conrad	3,100	0.45	1.5	2.0	2.85

Notes: [1]Onbase residential population.
[2]Treatment is performed by the City of Great Falls, capacity of interconnection is given.
[3]Capacity is limited by a delivery rate of 16 and 20-inch transmission lines.

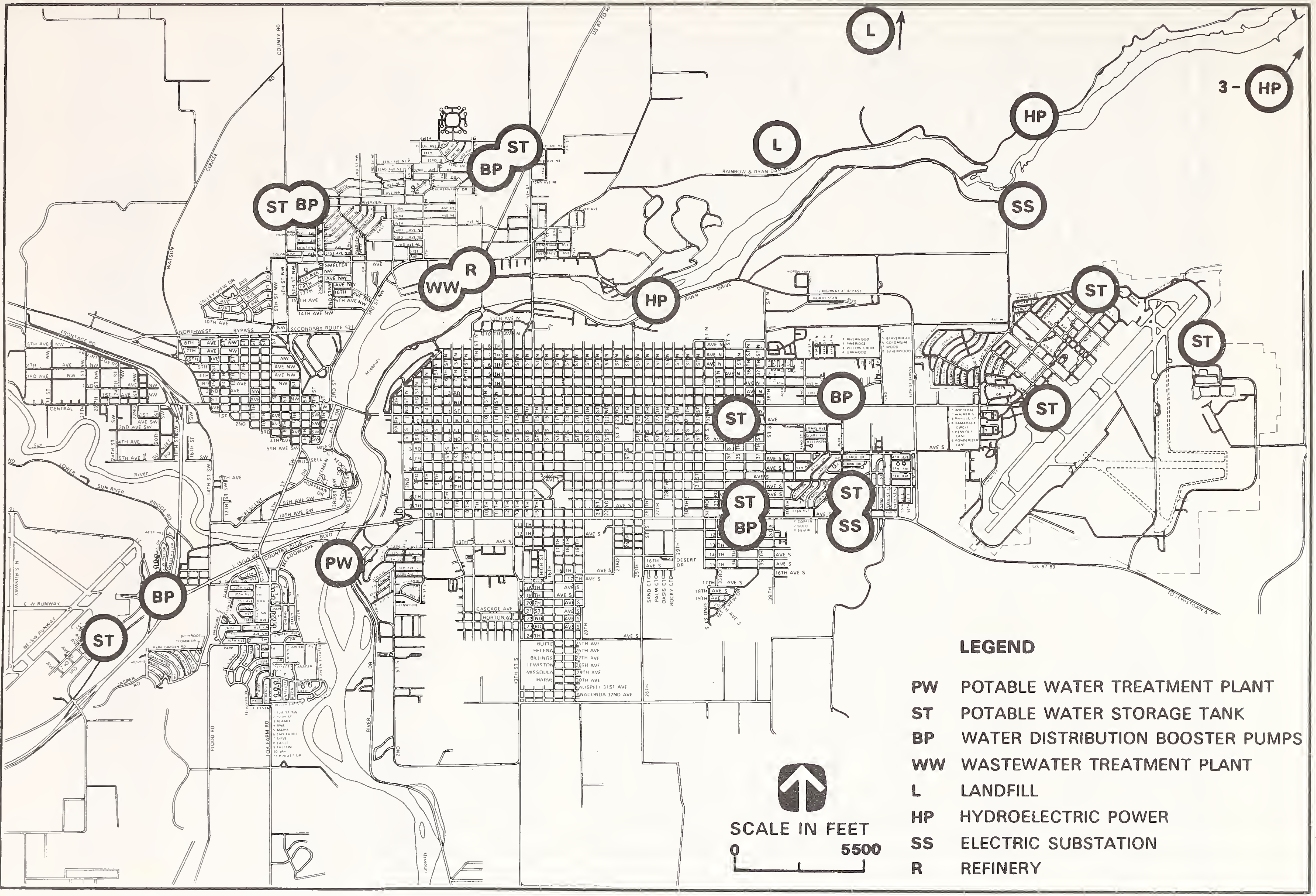


FIGURE 3.2.3-1 UTILITY INSTALLATIONS IN GREAT FALLS

Malmstrom Air Force Base. Potable water use at Malmstrom AFB equaled 367 million gallons (MG) in fiscal year (FY) 1985. The present contract with the city allows for the use of 460 MG of water per year at a cost of $191,000. The base receives this supply through a 12-inch and an 8-inch main; the 12-inch main is connected to the base's water treatment plant. Water delivered by the city is monitored at the treatment plant and additional chlorine is added as required. The 8-inch main, built in 1986, is directly connected to the onbase distribution system. Total capacity of the interconnection at 70 pounds per square inch is estimated to be 3.37 MGD. The onbase distribution system consists of 8, 10, and 12-inch looped mains constructed primarily of cast iron, asbestos cement, or polyvinyl chloride (PVC). All new mains are now constructed of PVC since local soil conditions corrode cast iron pipe. Onbase storage tank capacity equals 2.2 MG with an additional 0.6-MG tank at the Weapon Storage Area (WSA) for fire protection.

To meet water demands during emergencies or periods of high consumption, the base has developed a plan to reduce water use. The plan calls for reduced lawn watering and car washing throughout the base and distribution of home-conservation information to onbase residents. Additional conservation efforts include closing specific valves and partially reducing water flows to the housing areas.

The 20 launch control facilities obtain potable water from wells, commercial sources, and other facilities. Eleven launch control facilities have wells with daily use ranging from 580 to 870 gallons per day (gpd). Maximum production capacity of these wells is not available; however, daily production has been generally estimated at 700 gpd. Currently, water is being delivered to launch control facility D-1 since the well is experiencing sediment problems. An electrodialysis unit is presently used at facility I-1 to provide potable water. Seven launch control facilities receive water from commercial sources which include the cities of Conrad and Roy, and the Tri-County and Tiber County Water Districts. Facilities P-0, Q-0, R-0, and S-0 store supplies in 10,000-gallon tanks and facility J-1 has a 7,000-gallon tank. Facility H-1 draws water from a nearby spring, and facility T-0 obtains its supply from Lake Frances.

Onbase potable water requirements will increase by 0.20 MGD as a result of the KC-135R air refueling mission. This additional demand will increase average daily use to a total of 1.3 MGD by 1990. Onbase water use should remain relatively constant through the year 2000.

City of Lewistown. Potable water is supplied to Lewistown from Big Springs located approximately 7 miles southeast of the city. Two pipelines (16 and 20-inch) supply up to 6.9 MGD to approximately 7,100 residents. This includes 75 customers whose property is adjacent to the city's water supply lines but is located outside city limits. Average daily water use from 1983 to 1986 equaled 1.8 MGD with peak demands averaging 3.1 MGD. Two elevated steel storage tanks provide 1.35 MG of potable water for use in meeting peak demands and firefighting purposes. The city's distribution system consists primarily of 4 and 6-inch laterals with major distribution mains measuring 10, 12, and 14 inches. In order to service the existing population and accommodate new growth, 10-inch mains have been installed in the eastern, southern, and western portions of the city. Voluntary water restrictions have been instituted during the summer to control lawn watering and other uses.

Lewistown's service area population will be 7,300 in 1990 and 7,500 persons in the year 2000 including 200 persons outside the city limits. The average daily demand will increase to 1.85 MGD in 1990 and 1.9 MGD in the year 2000. The city's system can presently supply 6.9 MGD, and average daily demands will equal 28 percent of capacity in

the year 2000. Adequate capacity will be available for future growth without the construction of any additional system facilities.

City of Conrad. Potable water is supplied to the City of Conrad from Lake Frances, which is located approximately 12 miles to the northwest. Water is obtained from the Pondera Canal and Reservoir Company and is delivered to the city through two 12-inch pipelines. Two 2,000-gpm pumps deliver the supply to a 2.85-MGD filtration facility.

Storage consists of two 1-MG storage tanks. Currently, average daily demands equal 0.45 MGD with maximum daily demands reaching 1.5 MGD. According to the 1978 update to the Conrad/Pondera Comprehensive Plan, the water distribution system was upgraded in 1977 and should be adequate for future growth. The city has indicated that the existing intake structure at Lake Frances could be relocated so that additional supplies would be available. Recent estimates indicate that reconstruction of the facility will cost approximately $1.5 million. Currently, there are no plans to fund this improvement.

Conrad's service area population is projected to increase to 3,400 in 1990 and 3,700 in the year 2000. Potable water demands will increase to 0.48 MGD in 1990 and 0.52 MGD in the year 2000. The filtration facility will be operating at 18-percent capacity in the year 2000, with adequate capacity to meet projected demands.

3.2.3.2 Wastewater

Wastewater treatment facilities serving the ROI are identified in Table 3.2.3-2. Each of the facilities examined has adequate capacity for existing and future demands.

Table 3.2.3-2

Wastewater Treatment Facilities Within the Region of Influence

Community	1986 Service Population	Average Per Capita Generation (gpcd)	Average Waste Flow (MGD)	Peak Waste Flow (MGD)	Type	Treatment Capacity (MGD)
Great Falls	64,600	145	9.4	42.0	AS[1]	21.0
Malmstrom AFB	6,200[2]	105	0.65	0.9	N/A[3]	N/A
Lewistown	6,900	345	2.38	2.83	RBC[4]	9.0
Conrad	3,100	100	0.43	0.58	Lagoon	0.6[5]

Notes: [1]AS = Activated sludge.
[2]Onbase residential population.
[3]N/A = Not applicable, treatment provided by the City of Great Falls.
[4]RBC= Rotating biological contactors.
[5]Population equivalent of 6,000 persons.

City of Great Falls. Wastewater from Great Falls and Malmstrom AFB is treated at a regional wastewater facility operated under contract with the City of Great Falls by Envirotech Operating Services. This activated-sludge facility has a design capacity of 21 MGD and 60,000 pounds per day (lb/day) of total solids. Average daily flows to the facility, generated by approximately 64,600 persons, were 9.4 MGD in 1986 including a flow of 0.65 MGD from the base. Discharges from the plant to the Missouri River have consistently met the Montana Pollutant Discharge Elimination System permit requirements. Yearly averages of the effluent's biochemical oxygen demand (BOD) and total suspended solids (TSS) were 10 milligrams per liter (mg/l) and 9 mg/l. These averages are below the required secondary treatment standard of 30 mg/l BOD and 30 mg/l TSS.

The city's sewer system consists of 189 miles of sanitary sewers and 27 lift stations. An older portion of the sewer system in the downtown area still consists of combined storm and sanitary sewers. During rainstorms and periods of rapid snow melt, high flows enter this system. During such situations, untreated wastewater has been bypassed to the Missouri River since the flows exceed the capacity of the pump station at 6th Street and River Drive. Flows at the treatment plant have ranged from 30 to 50 MGD or three to five times above normal.

Because this situation was only one of the problems associated with an aging system, an analysis was performed in 1981 to identify the extent of infiltration/inflow and other structural problems in the existing sewers. This report identified serious problems with the northeast interceptor sewer, noting that it was inadequate to provide expanded service to Malmstrom AFB and the eastern portion of the city. Other recommendations included the separation of the combined sewers in 3rd and 6th streets, replacement of deteriorating sewers in the country club addition, and replacement of specific outfalls, inlets, and pipe sections. To alleviate these problems, the city has incorporated sewer replacement and improvement projects, including improvements to the northeast interceptor, into its budget. Current efforts include the Heren Park relief sewer, separation of combined downtown sewers ($1.3 million), the south interceptor sewer, and $536,000 in sewer-line replacement.

The service population of the Great Falls treatment plant will increase to 66,800 persons by 1990 and to 68,300 persons in the year 2000. Wastewater flows are anticipated to increase to 9.6 MGD in 1990 and to 9.9 MGD by the year 2000. With the plant operating at 47 percent of capacity by the year 2000, adequate capacity will continue to be available at the existing 21-MG activated-sludge facility. Additional capacity will become available as the city continues to authorize improvement plans that reduce infiltration/inflow to the sewer system.

Malmstrom Air Force Base. Wastewater generation at Malmstrom AFB averages 0.65 MGD with peak flows equaling 0.9 MGD. The wastewater is collected by a gravity sewer system that consists mainly of 6 to 15-inch vitrified clay pipe. This system flows to a lift station on the northern edge of the base that pumps the sewage through a 12-inch force main to the Great Falls system. Capacity of the force main is estimated at 1,900 gallons per minute or 2.74 MGD. The present contract with the city provides for the treatment of 300 MG of effluent at a cost of $150,000. In FY 1985, the city processed a total of 236 MG of sewage from the base at a cost of $124,931. Wastewater flows at the WSA are treated by a septic tank, deep trench, and mound system. Four other septic tanks serve other isolated facilities onbase. Each of the 20 launch control facilities has a limited capacity sewage lagoon.

With the addition of the KC-135R air refueling mission, it is estimated that wastewater flows will increase by 0.10 MGD in 1989 to 0.75 MGD. Currently, there are no improvements planned to the base system other than the tie-ins associated with the new missions. Adequate capacity will be available in the existing force main to handle these wastewater flows.

City of Lewistown. Wastewater is treated at a recently improved secondary treatment plant located in the northwest portion of the city. The plant discharges approximately 2.38 MGD to Big Spring Creek. The upgraded treatment plant began operation in July 1986 and has a capacity of 2.83 MGD. The plant uses rotating biological contactors (RBCs) and ultraviolet disinfection to meet secondary standards. The city's sewer system consists mainly of 8 and 10-inch sewers. The system does not extend to the Castle View housing addition in the northwestern portion of the city. This area, as well as all other areas outside the city limits, use septic systems for wastewater disposal. Wastewater flows processed at the treatment plant are being surcharged by groundwater which is infiltrating into the sanitary sewers. This condition is especially prevalent in the southern part of the city where the groundwater table is high and the sewers are made of tile with unsealed joints. The extent of this problem is illustrated by comparing the water use of 1.8 MGD to the actual wastewater processed, which is 2.38 MGD. Currently, there is no specific program planned to alleviate this problem.

Lewistown's service area population is expected to grow to 7,100 persons in 1990 and to 7,300 persons by the year 2000. Wastewater flows are estimated to increase to 2.5 MGD in 1990 and remain at that level through the year 2000. Flows are expected to stabilize as infiltration to the system is reduced as a result of a periodic maintenance of sewers and manholes and emergency replacements of pipe sections. In the year 2000, the treatment plant will be operating at 87 percent of capacity and it will be adequate to process the projected flows.

City of Conrad. Wastewater generated by the City of Conrad is treated in a lagoon system that is located northeast of the city. This system consists of one aerated pond and two settling ponds and has the capacity to treat the flows from 6,000 persons. Average daily flows in 1986 were 0.43 MGD; however, wet springtime weather produced high groundwater conditions that led to infiltration problems in the city's sewer system and increased flows by 34 percent. Typically, wastewater flows have averaged 0.32 MGD or approximately 100 gallons per capita per day. Currently, the ponds operate at 60-percent capacity. Discharge from the ponds is continuous to the Dry Fork of the Marias River.

Conrad's wastewater flows are expected to increase to 0.35 MGD in 1990 and 0.38 MGD by the year 2000. The existing lagoons will be operating at 62-percent capacity in the year 2000 with adequate capacity to treat projected flows.

3.2.3.3 Solid Waste

Solid waste collection and disposal service in the ROI is summarized in Table 3.2.3-3. Currently, the systems are adequate to service all residential and commercial collection and disposal needs.

City of Great Falls. The City of Great Falls Public Works Department provides collection and disposal service to 10,000 residential and 1,200 commercial customers within the city limits. The city's collection and disposal service currently includes seven personnel and operates seven collection vehicles. Approximately 225 tons per day (T/day) are

Table 3.2.3-3

Solid Waste Collection and Disposal in the Region of Influence (1986)

	Great Falls		Lewistown		Conrad
	City of Great Falls Landfill	Greens Disposal Landfill Site No. 1	Severson's Disposal Landfill	Mister "M" Disposal Landfill	City of Conrad Landfill
Collection Source	City of Great Falls, Public Works Department	Green's Disposal Black Eagle Disposal	Severson's Disposal Department	Mister "M" Disposal	City of Conrad, Public Works
Number of Customers					
Residential	10,000	8,000	550	1,300[1]	1,250[2]
Commercial	1,200	700	70	300[1]	
Collection and Disposal Costs					
Residential	$5.50/month	$ 4.00/month[3]	$8.00/month	$ 9.20/month	$8.70/month
Rural	--	$10.00/month	--	$10.40/month	--
Commercial	--	--	--	$ 9.20/month	$8.70 to 100/month
Site Location	2 mi northeast of Black Eagle	10 mi north of Great Falls	2 mi east of Lewistown	3 mi east of Lewistown	2 mi northeast of Conrad
Disposal Rate	225 T/day	120 T/day	17 T/day[4]	9 T/day	36 T/day[5]
Remaining Capacity	2,360,000 cy	780,000 cy	221,000 cy	117,000 cy	460,000 cy
Remaining Service Life	15 to 20 years	10 years	20 years+	20 years	20 years

Notes:
[1]In seven-county region.
[2]Combined residential and commercial customers.
[3]Minimum charge, for senior citizens.
[4]Based on average daily disposal of 36 cy.
[5]Based on average yearly disposal of 23,000 cy.

disposed at the city-owned landfill. The site located north of Rainbow Dam Road and the Anaconda smelter site presently contains 127 acres. Based on the current disposal rate, the landfill has an estimated remaining service life of 15 to 20 years. Currently, the city is leasing an additional 40 acres adjacent to the existing site for future disposal requirements.

Collection and disposal is also provided by two private companies: Greens Disposal and Black Eagle Disposal (both owned by Bayside Waste, Hauling, and Transfer, Inc. of Redmond, Washington). Together, the two companies serve approximately 8,000 residential and 700 commercial accounts within the City of Great Falls, the surrounding rural areas, and Malmstrom AFB. Greens and Black Eagle have 18 collection vehicles on 14 routes and dispose of approximately 120 T/day at Greens Disposal Site No. 1. Currently, Greens Disposal Site No. 1, located 10 miles north of Great Falls, has a remaining service life of 10 years, at which time Site No. 2 will be placed into operation. Site No. 2, an 80 to 100-acre permitted site in a nearby coulee, will have an estimated service life of between 75 and 100 years.

The service area population of all three collectors will increase to 79,200 persons in 1990 and to 81,100 persons by the year 2000. It is estimated that total daily disposal requirements will increase from the current volume of 345 T/day to 357 T/day in 1990 and to 366 T/day by the year 2000. Some changes in the collection routes may be necessary; however, the disposal services have included population increases in their projected remaining landfill capacity, and will be able to adequately service the baseline solid waste disposal needs.

Malmstrom Air Force Base. Solid waste generated onbase is collected and disposed of by Greens Disposal Company. A total of 4,040 tons per year (T/yr) or approximately 11 T/day were generated onbase in 1985. This included approximately 1,700 T/yr generated in the industrial areas, and 2,340 T/yr generated within the housing areas. Refuse from the launch control facilities is brought back to the base and removed by Greens Disposal Company along with other wastes. The annual cost of the pickup, delivery, and removal of waste from the base is approximately $125,000. Greens Disposal Company was recently awarded a new 1-year contract with a 2-year option by the base for collection and disposal of all nonhazardous wastes.

The Air Force operates a Resource Recovery and Recycling Program onbase for metals, paper, cardboard, and tires.

The KC-135R air refueling mission at Malmstrom AFB will generate an increase in solid wastes. These wastes will be similar to those generated by the Minuteman missile maintenance program, and the existing procedures are adequate to handle the additional wastes. Construction and operations wastes associated with the new mission will be hauled offbase under a contract with a licensed solid waste disposal contractor.

City of Lewistown. Solid waste collection and disposal in the City of Lewistown is provided by two private companies, Seversons Disposal and Mister "M" Disposal. Seversons operates within a 5-mile radius of Lewistown, and provides collection for approximately 550 residential and 70 commercial accounts. The company leases land from a private owner for a Class II landfill 2 miles east of the city. Approximately 10,000 cubic yards per year (cy/yr) or 17 T/day of waste are deposited at the site. The company is presently using 25 acres for disposal; however, according to the company's owner, there is unlimited space available for disposal.

Mister "M" Disposal provides collection and disposal service to a seven-county region in Montana, including 1,300 residential and 300 commercial customers. The company operates a Class II landfill 3 miles east of Lewistown on U.S. 87 and disposes of approximately 9 T/day at the site. The site is adequate for all disposal needs, and at the present rate of disposal, will remain in service for 20 years, through the year 2006.

Lewistown's population is projected to increase by 200 persons between 1985 and 1990, and again between 1990 and the year 2000. Solid waste generation is expected to increase similarly and will be handled by the existing collection and disposal systems.

City of Conrad. The City of Conrad Public Works Department provides collection and disposal service for approximately 1,250 residential and commercial accounts within the city limits. Two drivers and two vehicles provide weekly collection for residential customers and daily collection for commercial accounts. The city replaces its collection vehicles every 5 years. A new 12-cubic yard (cy) collection truck will be purchased in 1987. Residents outside of the city haul their refuse to the city-owned landfill. Approximately 23,700 cy/yr or 36 T/day are deposited by the city haulers; the amount from individual haulers is not weighed.

The city-owned landfill is located 2 miles northeast of Conrad on land adjacent to the city-owned sewage lagoons. Only 5 acres of the original 40-acre site are still being used for disposal; however, city officials estimate the remaining service life to be 20 years. The city plans to begin siting a new facility within the next 10 years (1996-1997) to replace the existing site.

The population of Conrad is projected to increase to 3,400 persons by 1990 and to 3,700 persons by the year 2000. Solid waste generation in the area will increase similarly, and the existing and planned additions to the collection and disposal system will be adequate to handle the baseline solid waste generation.

Hazardous Wastes. Approximately 700,000 gallons of hazardous wastes are produced in Montana annually. The municipal and private landfills do not accept toxic or hazardous wastes for disposal. All hazardous wastes generated within the ROI are transported out-of-state to a variety of Environmental Protection Agency permitted facilities. Special Resource Management Inc., a subsidiary of Montana Power Company, is currently planning to establish and operate two hazardous waste transfer stations in Butte and Billings. The facilities will serve as temporary storage (maximum of 10 days) of hazardous materials prior to transport out-of-state.

Malmstrom AFB generated approximately 13,200 pounds of hazardous waste in calendar year (CY) 1985. Hazardous waste materials are stored at accumulation points in or near the waste generation facility. The Defense Reutilization and Marketing Office arranges for out-of-state disposal by contract with a private company. Of the total waste generated in CY 1985, 11,194 pounds were transported and treated, and the remainder was stored onbase awaiting disposal action. The waste can be stored onbase for no more than 90 days, and then must be transported to a permitted treatment, storage, and disposal facility. The FY 1987 Operations and Maintenance program includes $196,000 for a new permanent hazardous waste storage facility.

3.2.3.4 Energy Utilities

Electricity.

Regional Overview. Montana's electricity needs have historically been met by hydroelectric generation (85-99%), supplemented by coal generation. Since 1976, the percentage of hydroelectric capacity has been steadily declining, and by 1984, it accounted for only 53 percent of generating capacity. At the same time, the percentage of coal generation has increased, and by 1984 accounted for 41 percent of the total electricity generated in the state. Out of a total of 4,008 megawatts (MW) of electricity generated in Montana in 1984, 2,116 MW were from hydroelectric plants and 1,877 MW were from fossil fuel-fired plants.

The electrical distributors in Montana include Montana Power Company (MPC), a private utility company; the Western Area Power Administration (WAPA), the marketing agency for federal government power-generating facilities; and rural electric cooperatives. Together these companies, agencies, or their suppliers accounted for approximately 55 billion kWh of sales in 1985. These distributors or their suppliers are members of the Western System Coordinating Council (WSCC), one of the nine regional councils of the North American Electric Reliability Council. The Northwest Power Pool area of the WSCC encompasses seven western states (including the central portion of Montana), and is interconnected by a vast transmission system that ensures electric service reliability among 28 utility organizations. The major electrical transmission lines within the ROI are shown in Figure 3.2.3-2.

Local Distributors. The MPC provides electrical service to the municipal areas of Cascade, Fergus, and Pondera counties. Three rural electric cooperatives, Fergus, Sun River, and Marias River, supply electrical power to the rural areas of the ROI as shown in Figure 3.2.3-3. The characteristics of the regional electric retailers are presented in Table 3.2.3-4.

In 1985, MPC had a system capability of 1,510 MW, including approximately 1,313 MW of generating capability and 197 MW of purchased power. A record peak demand of 1,295 MW was recorded in 1985, with a 14-percent reserve margin. Total sales of electricity for the system were 7.6 billion kWh, a 1-percent increase from 1984. Average annual residential consumption was 9,267 kWh per year, at a cost of $0.0433 per kWh, compared to the national average of $0.0795 per kWh.

The MPC projects a 1.6-percent average annual increase in peak demand between 1986 and the year 2000. To meet the projected peak demands of 1,441 MW in 1990 and 1,710 MW in the year 2000, the company will rely on purchased power and hydroelectric generating plant upgrades. Reserve margins will be 12 percent in 1990 and 10 percent in the year 2000. Because of the loss of a large industrial load, a decline in the rate of systemwide growth, and substantial future contracts for cogeneration and small-power production, the company has sold its share of Colstrip Unit 4 (a coal-fired plant with a proposed output of 700 MW). It is currently leasing back the 210-MW interest from the new owners to sell to other utilities. An increase in load in the company's service area could be met with the power available from this unit.

Total energy sales are projected to grow at a 1.4-percent annual rate from 1986 to the year 2009. This forecasted growth rate is lower than that experienced from 1960 to 1984, and is attributed to slower economic growth in the state and increasing electricity prices. This follows a similar national trend in slower economic growth and

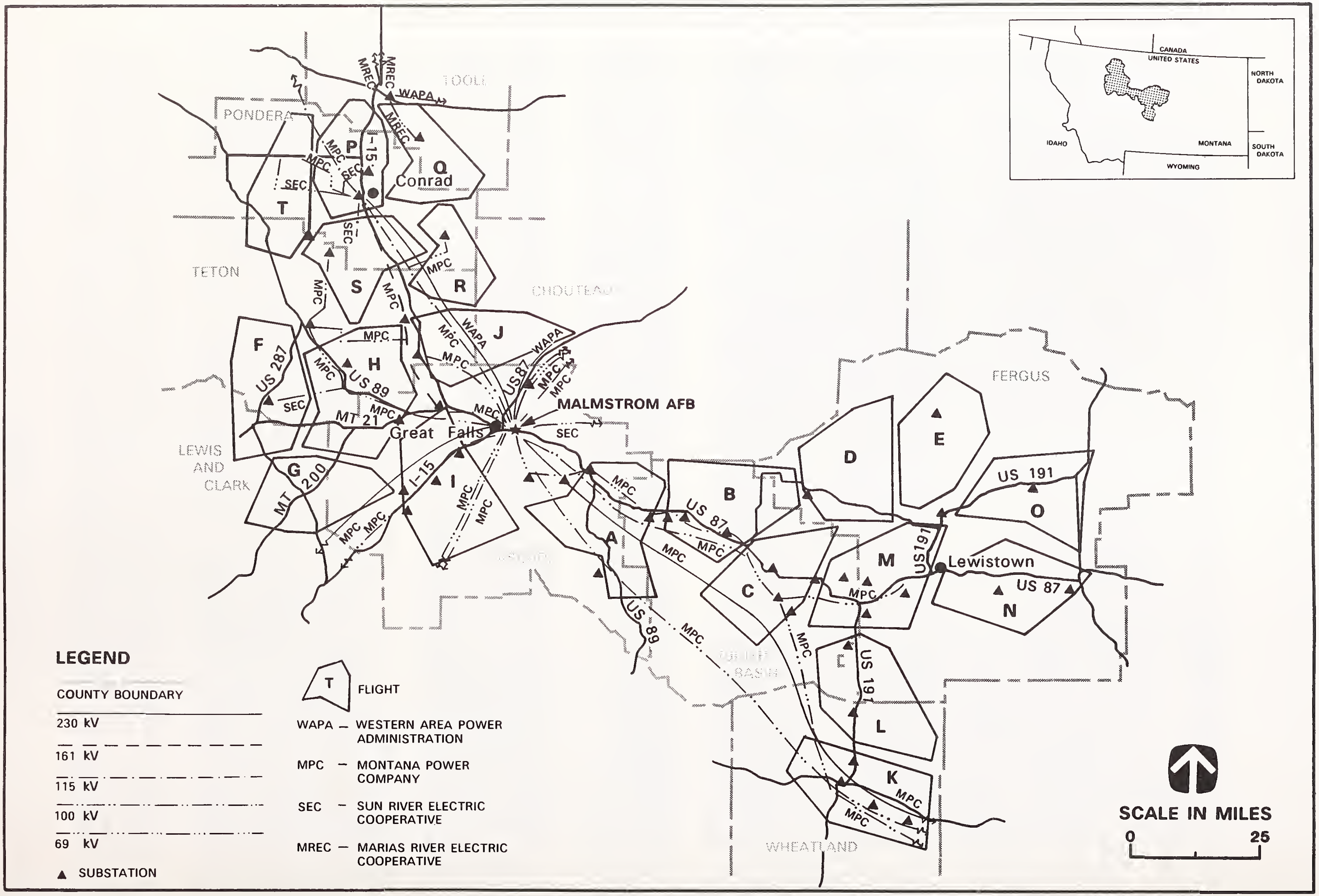


FIGURE 3.2.3-2 MAJOR ELECTRICAL TRANSMISSION LINES IN THE REGION OF INFLUENCE

EM3-UT/1

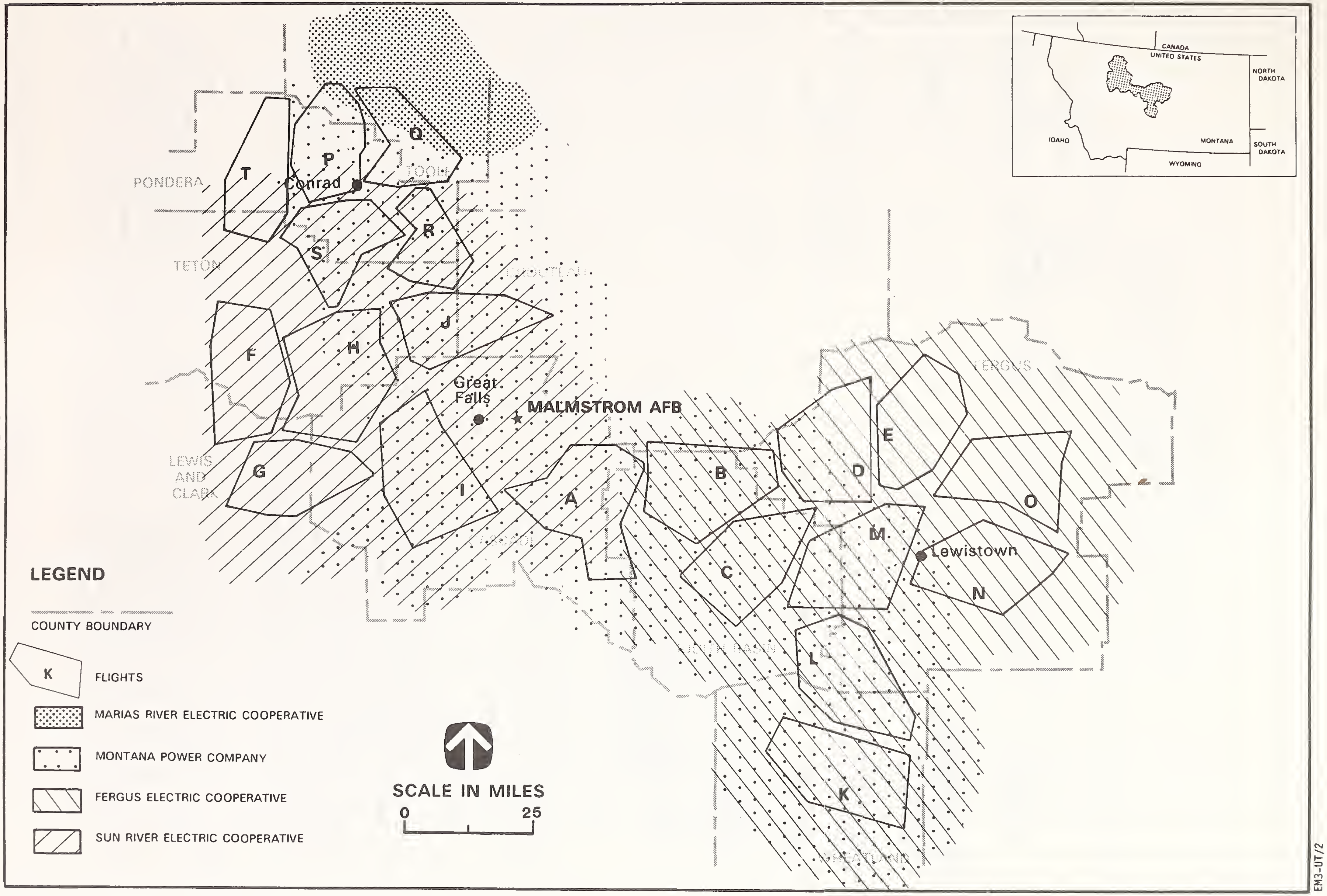


FIGURE 3.2.3-3 ELECTRIC UTILITY SERVICE AREAS IN THE REGION OF INFLUENCE

Table 3.2.3-4

Characteristics of Montana Electric Utilities
(1985)

Utility	Headquarters Location	Number of Customers	Peak Demand (MW)	Total Energy Sales[1] (1,000 kWh)	Sales to Malmstrom AFB (1,000 kWh)
Private Utilities:					
Montana Power Power Co.	Butte, MT	243,384	1,295	7,641,000	57,800[2]
Cooperatives:					
Fergus Electric	Lewistown, MT	4,777	17.7	68,500[3]	10,050
Marias River Electric	Shelby, MT	3,818	22.3	95,200	1,390
Sun River Electric	Fairfield, MT	4,320	25.4	80,800	7,000

Notes: [1]Includes cooperatives own use.
[2]Includes sales to base and launch facilities.
[3]Estimate based on monthly average.

rising electricity prices. The MPC operates five hydroelectric generating plants and the largest network of transmission lines in the ROI, including two 230-kilovolt (kV) lines, one 161-kV line, one 115-kV line, five 100-kV lines, and five 69-kV lines, as well as various lines below 69 kV.

The Fergus, Marias River, and Sun River rural electric cooperatives supply electrical service to the rural portions of Fergus, Toole, Pondera, and Cascade counties. The cooperatives do not operate any generating facilities, but purchase power from regional wholesalers through the Central Montana Electric Power Cooperative. Formed by 13 member cooperatives, Central Montana Electric purchases power from MPC, WAPA, and Basin Electric Cooperative in Bismarck, North Dakota, for sale to the member cooperatives. Central Montana uses a blended rate for the member cooperatives, and differences result from individual load factors of the member cooperatives. The cooperatives' rates for their residential customers are indicated in Table 3.2.3-5.

In 1985, Fergus Electric purchased approximately 75,700,000 kWh from Central Montana. Sales to customers and their own use is estimated at 68,500,000 kWh, based on monthly averages. The estimated reserve margin was 10 percent. Marias River purchased a total of 106,515,200 kWh in 1985. Total sales and their own use accounted for 95,187,200 kWh, with a 10-percent reserve margin. Sun River Electric purchased a total of 91,760,000 kWh from Central Montana in 1985. The company's sales and own use totaled 80,841,700 kWh, with a 13-percent reserve margin.

Table 3.2.3-5

Residential Electricity Rates for Montana Rural Electric Cooperatives (1986)

Supplier	Marias River Electric	Sun River Electric	Fergus Electric
Base Rate/Month	\$4.00	\$7.00	\$11.00[1]
Charge/kWh	3.1¢	4.5¢	5.5¢[2] 3.7¢[3]

Notes: [1]For first 30 kWh.
[2]For the next 970 kWh.
[3]For 1,001 kWh and over.

The rural cooperatives prepare power requirement studies to project yearly sales and peak demands. The studies are based on historical development and trends that influence the company's load growth and power requirements. Fergus Electric projects total system energy requirements to decrease at a 1.5-percent average annual compound rate between 1984 and 1989. A small increase (0.6%) is projected between 1989 and the year 2000. As a result, energy requirements are projected to be 81,489,000 kWh in 1990 and 86,574,000 kWh in the year 2000. Fergus Electric experiences highest peak demand in the winter. Winter peak demand is projected to decrease at a 0.5-percent average annual compound rate between 1984 and the year 2000, and is projected to be 21.7 MW in 1990 and 22.9 MW in the year 2000. The company anticipates a 4-percent rate increase in June 1987 due to increased costs from Central Montana Electric.

Between 1984 and the year 2000, Marias River Electric projects system energy requirements to increase at a 3.1-percent average annual compound rate. Requirements are projected to be 129,094,000 kWh in 1990, and 167,308,000 kWh in the year 2000. During the same time period, peak demand (winter) is projected to increase at a 2.6-percent average annual compound rate, to 26.5 MW in 1990 and to 34.2 MW in the year 2000. Between 1984 and the year 2000, Sun River Electric projects system energy requirements to increase at a 4-percent average annual compound rate. Requirements are projected to be 100,349,000 kWh in 1990 and 118,337,000 kWh in the year 2000. Sun River experiences its highest peak demand in the summer. Peak demand is projected to increase at a 1.2-percent average annual compound rate, and is projected to be 25.5 MW in 1990 and 30 MW in the year 2000. The member cooperatives receive all needed power from Central Montana Electric in accordance with their individual power requirement projections.

Malmstrom Air Force Base. The MPC and Fergus, Marias River, and Sun River rural electric cooperatives supply power to the base and deployment area. In FY 1985, the base electricity consumption was 40,438,800 kWh at a cost of \$1,193,672. Monthly peak demand for FY 1985 was 7,300 kilowatts (kW). Service to the base is supplied by MPC from the Great Falls northeast substation, located 0.8 mile north of the base. The substation has a transformer capacity of 20 megavolt-amperes (MVA), and supplies power to

the base and to other MPC customers. Peak demand on the substation was 10.3 MVA in 1985. Backup feed to the base is supplied by the Great Falls eastside substation, located approximately 1.5 miles west of the base. The substation has a transformer capacity of 20 MVA; peak demand on the substation in 1985 was 23 MVA.

Distribution onbase is via 12.5-kV overhead lines. About 90 to 95 percent of the system capacity is presently used to supply power. A major portion of the onbase overhead distribution system has been in service for over 30 years and has not had a major upgrade in the past 20 years. The base also has 43 generators with a capacity of 3,075 kW; current load is approximately 50 percent.

With the addition of the KC-135R air refueling mission, demand onbase is projected to increase by 3.5 MW to a total of 11 MW. Additional power requirements can be supplied by MPC or from WAPA. Power available from WAPA is allocated to customers on a priority basis, and under this system Malmstrom AFB would be an eligible preference customer. Currently, all firm power (i.e., power required by contract) is allocated, and reallocation will not be performed until after the year 2000. However, there is a possibility that the current Air Force allocation for another installation could be reallocated to Malmstrom AFB. A complete upgrade of the onbase distribution system is planned for FY 1992 at an estimated cost of $8,000,000. In addition, a new 115-kV transmission line and 30-MW substation may be installed onbase prior to 1990, and will replace the use of the Great Falls northeast substation. The MPC plans to increase the capacity of the eastside substation by 25 percent with the addition of fan cooling to the transformer banks.

Launch Control Facilities and Launch Facilities. Fergus, Marias River, and Sun River rural electric cooperatives supply power to 110 of the launch facilities and 8 launch control facilities. In FY 1985, they supplied approximately 18,230,000 kWh of electricity to the sites, at a combined cost of $714,001. Rates for the facilities are indicated in Table 3.2.3-6. The facilities have a high load factor and therefore receive attractive rates. According to the cooperatives, any new facility would receive the same rates. The MPC supplies power to a total of 90 launch facilities and 12 launch control facilities, and in FY 1985 supplied 17,350,080 kWh at a cost of $544,007. There are 50 substations that distribute power to the launch facilities and launch control facilities.

Typical electrical service to the Minuteman II launch control facilities and launch facilities is three-phase, four-wire, 60-cycle alternating current. The primary voltage of the suppliers' high-tension lines is 7.2/12.47 kV; secondary voltage is 120/208 volts. Transformer capacities for the launch control facilities are three 50 kVA (single phase); transformer capacities for the launch facilities are three 25 kVA (single phase). In 1985, maximum demand was approximately 75 kW at the launch control facilities, utilizing 50 percent of the capacity. In 1985, the maximum demand at 63 launch facilities was approximately 50 kW, utilizing 66 percent of the capacity. Maximum demand at 87 launch facilities was approximately 75 kW, utilizing 85 percent of the capacity. The estimated maximum demand at 87 launch facilities is 60 kW; in 1985, maximum demand was approximately 65 kW.

Typical service to the Minuteman III launch control facilities and launch facilities is three-phase, three-wire, 60-cycle alternating current. The primary voltage is 7.2/12.47 kV; secondary voltage is 456 volts. Transformer capacities for the launch control facilities are three 75 kVA (single phase); transformer capacities for the launch facilities are three 37.5 kVA (single phase). In 1985, the maximum demand at the launch control facilities was approximately 165 kW, using 75 percent of the capacity. The

Table 3.2.3-6

Electricity Rates for Malmstrom AFB
Launch Facilities and Launch Control Facilities
(1986)

Supplier	Marias River Electric	Sun River Electric	Fergus Electric	Montana Power Company	
				Winter	Summer
Base Rate/Month	$6.50	$2.80/ installed KVA	$1.65/ installed KVA	$3.93	$3.93
Energy Charge/ kWh	3.7¢ for 1st 3,000 kWh	$3.49 for first 210,000 kWh	$1.46	$5.16 for first 3,000 kWh	4.3¢ for first 3,000 kWh
	2.9¢ all additional kWh	3.1¢ for next 200 kWh/kW		$3.18 for all additional kWh	$2.65¢ for all additional kWh
		2.3¢ for all additional kWh			
Demand Charge/kWh	$3.65 for excess above 10 kW	$4.65[1]	$12.75[1]	$4.99 for excess[2] above 10 kW	$3.11 for excess[2] above 10 kW

Notes: [1]Based on the maximum kW demand for 30-minute period during the month.
[2]Based on the maximum kW demand for 15-minute period during the month.

Sources: Marias River Electric Cooperative 1986 rate schedules; Sun River Electric Cooperative 1984 rate schedules; Fergus Electric Cooperative, Inc. 1986 rate schedules; and Montana Power Company 1981 rate schedules.

maximum demand at the launch facilities was approximately 80 kW, using 70 percent of the capacity. The suppliers own and operate the substations, transformers, lines, and meters up to and including the service pole for each launch control facility and launch facility.

Natural Gas and Heating.

Regional Overview. Natural gas sales in Montana rose steadily from 1950 until the mid-1970s when sales began to dramatically decline. Historically, the industrial sector has been the largest user of natural gas, with the residential sector the second largest user. This trend reversed in 1979, and by 1985, the residential sector was the largest user of natural gas and the commercial sector became the second largest user. In 1985, total sales of natural gas in Montana were approximately 43 million cubic feet (MMcf). The residential sector accounted for 47 percent of sales, the commercial sector for 31 percent, and the industrial sector accounted for 15 percent of sales; the remainder was used by electric-generating utilities and other users. Figure 3.2.3-4 identifies the natural gas and liquid fuels pipelines in the ROI.

Local Distributors. Great Falls Gas Company and MPC supply natural gas in the ROI. The service characteristics of these companies are presented in Table 3.2.3-7. The Great Falls Gas Company provides natural gas to the City of Great Falls, with supplies purchased from MPC gas fields in Alberta, Canada. Sales in FY 1985 for the Great Falls Gas Company reached 4,920 MMcf, a 2.8-percent increase from 1984. In 1985, the Great Falls Gas Company provided service to approximately 22,518 customers, and average annual residential consumption was 115 Mcf. Great Falls Gas Company prices are some of the lowest in the nation. Residential rates are $4.11 per Mcf, compared to the national average of $6.12 per Mcf. The company currently has a 30-percent excess capacity margin due to reduced use as a result of conservation measures. This enables the company to increase their operations from 5 MMcf up to an additional 30 MMcf for peak consumption.

Table 3.2.3-7

Natural Gas Consumption in the Region of Influence (1985)

Distributor	Number of Customers	Gas Sold (MMcf)	Annual Residential Customer Use (Mcf)	Average Annual Residential Cost
Great Falls Gas Co.	22,518	4,920	115	$461
Montana Power Co.	103,748	35,632	130	$498

Sources: Great Falls Gas Company 1986; Montana Power Company 1986.

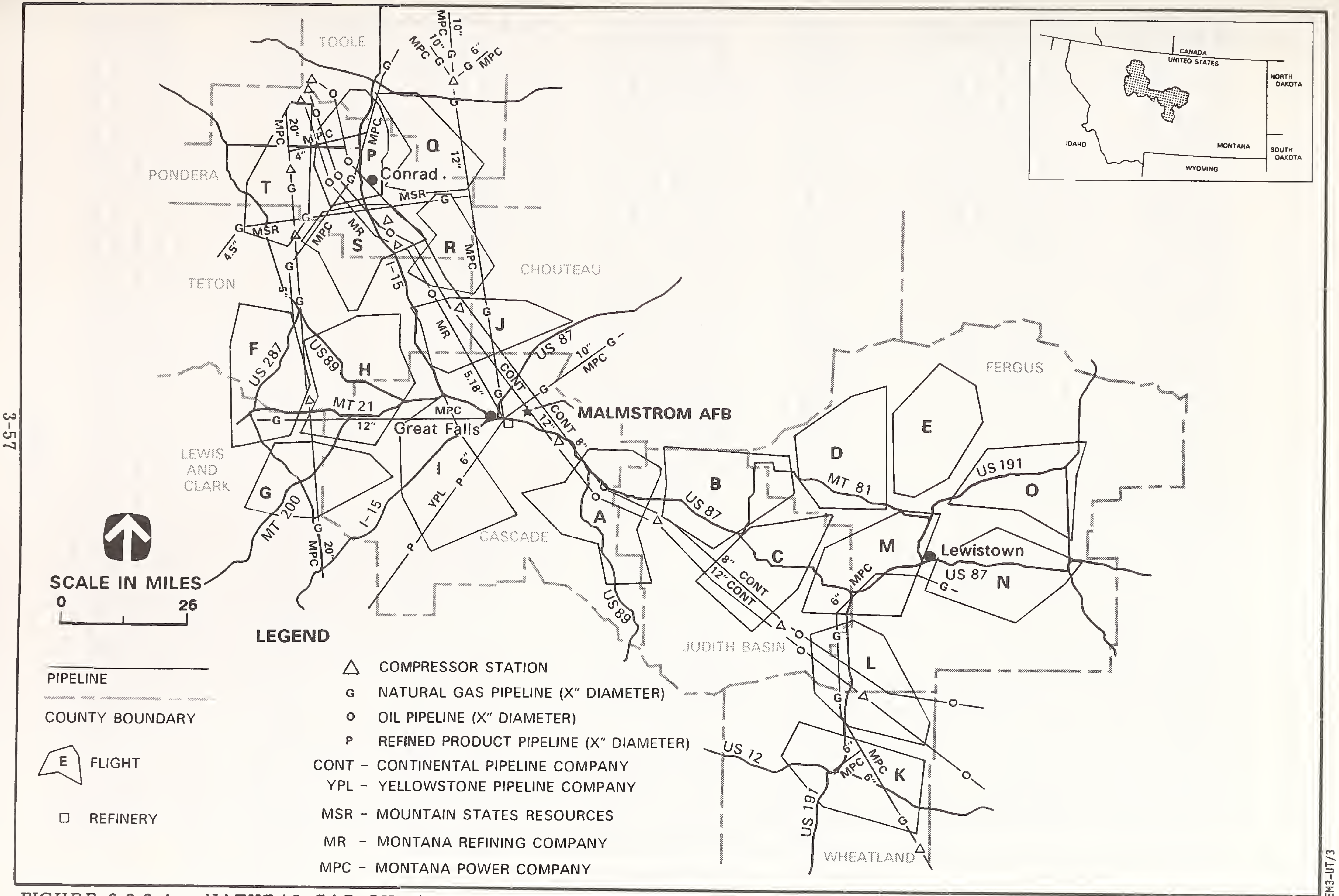


FIGURE 3.2.3-4 NATURAL GAS, OIL, AND PRODUCT PIPELINES

EM3-UT/3

The Great Falls Gas Company anticipates growth in the residential, commercial, and industrial sectors, except for sales to Malmstrom AFB because of the installation of the coal-fired central heat plant and associated hot water distribution system. This represents a 6-percent loss of the company's total system load. Sales are projected to increase at a 2-percent annual rate between 1987 and 1997 to a total of approximately 5,200 MMcf in 1990 and 6,000 MMcf in 1997.

The MPC also provides natural gas service to the City of Great Falls, as well as to the municipal areas of Conrad and Lewistown. In 1985, the company sold a total of 35,632 MMcf to 103,748 customers. In 1985, average annual residential consumption for customers of MPC was 130 Mcf, a 5-percent increase over the 1984 consumption, which resulted from colder weather. Residential customers paid an average of $4.02 per Mcf in 1985. The company has adequate natural gas reserves to supply the system for 25 years, based on the company's own reserves plus reserves under long-term contract. The company reports that natural gas sales have stabilized, and projects sales should remain constant over the next 10 years.

Both Great Falls Gas Company and MPC received approval on January 1, 1987 for a decrease in natural gas prices for both residential and commercial customers. The 9.9 cents per Mcf decrease reflects lower gas costs from suppliers. Great Falls Gas Company customers will receive a net decrease of 3.8 cents per Mcf as a result of decreased loads in their service area.

Malmstrom Air Force Base. Great Falls Gas Company provides natural gas to the base via a 12-inch-diameter line with a rated capacity of 470 Mcf per hour. In FY 1985, the base consumed 575,049 Mcf. The heating system serves the housing area (including 1,406 permanent housing units and 58 privately owned mobile home spaces), the WSA, the Intermediate Maintenance Area, and 100 additional buildings. The 1987 estimate for onbase use is 275,000 Mcf. With the addition of new missions in 1988 and 1989, consumption is estimated to increase by 12,000 Mcf to a total of 287 MMcf.

In 1983, as part of the Air Force energy conservation assurance plan which called for the conversion of gas-burning installations to coal, a coal-fired central heat plant was installed onbase to serve the industrial and commercial-type facilities. The plant has three high-temperature water generators, each rated at 85 million British thermal units per hour (MBtu/h) output. Two generators will serve the daily heating requirements, and the third generator will be used for peak demands. The system began service in October 1986, but has not been operating under full load. The maximum existing heating load is estimated to be 102 MBtu/h in the winter and 10 MBtu/h in the summer. The minimum reserve capacity is assumed to be 160 percent. Preconstruction estimates of yearly coal use equaled 36,000 tons. During the winter of 1986-1987 (an exceptionally mild winter), only 5,000 tons were consumed. With the addition of the KC-135R air refueling mission, the peak heating load in 1990 will be approximately 163 MBtu/h, with a 95-percent reserve capacity. Increased coal consumption is estimated to be 9,000 T/yr. The existing heat plant will be adequate to handle the new load only if all three boilers are used.

Liquid Fuels.

Regional Overview. Montana's total gasoline sales in 1984 were 451,152,000 gallons. Per capita use was 548 gallons, 123 percent of the national average. Diesel sales totaled 198,933,000 gallons in 1984, with a per capita rate of 241 gallons, 232 percent of the national average. Transportation accounted for 57 percent of the state's diesel sales, and military use accounted for 0.4 percent.

Local Distributors. The local retailers of petroleum products purchase their supplies from either the Montana Refining Company of Black Eagle or the Yellowstone Pipeline Company of Billings.

Montana Refining Company operates a petroleum refinery in Black Eagle. The refinery and its oil pipeline have a capacity of 6,500 barrels per day (bbl/day) and currently operate at 6,000 bbl/day. The refinery produces regular, unleaded, and premium unleaded gasoline, No. 2 diesel fuel, Jet-A fuel (commercial airline fuel), JP-4 (aviation fuel), and all road oils (e.g., asphalt). The company receives 95 percent of its crude oil via the company-owned pipeline from the Hi-Line area north of Great Falls. The company's sales area encompasses a 150-mile radius from Great Falls. In 1986, the company produced a total of 2,410,621 barrels of petroleum products, an 18-percent increase from 1985.

Yellowstone Pipeline Company is jointly owned by Conoco, Exxon, and Union Oil companies. The pipeline carries refined products to the Great Falls area and portions of western Montana. Continental Pipeline Company owns and operates two oil pipelines that deliver crude oil to three refineries in the Billings area. Conoco operates a 52,000-bbl/day capacity refinery, the Exxon refinery has a 45,000-bbl/day capacity, and the Cenex refinery has a 40,000-bbl/day capacity.

Malmstrom Air Force Base. Liquid fuels are supplied to Malmstrom AFB through contracts with local and regional distributors. Fuel requirements are forecasted and contracts are filled through the Defense Fuels Supply Center (DFSC). The contract for JP-4 is renewed every 6 months, and the contract for ground fuels (e.g., gasoline and diesel) is renewed yearly. The fuel is delivered to the base from the refinery by Cenex Company in tanker trucks, and stored in 56 onbase storage tanks. Total liquid fuel storage capacity onbase is 52,715 barrels or 2.2 MG. In 1986, vehicle use of regular and unleaded gasoline was 482,067 gallons and 248,817 gallons of diesel. Nonvehicle use, such as that delivered to launch control facilities storage tanks, was 173,188 gallons of regular and unleaded gasoline and 161,146 gallons of diesel fuel.

The KC-135R air refueling mission will use approximately 12 MG of JP-4 fuel per year. Onbase fuel storage capacity will be increased by 60,000 barrels or 2.52 MG. The fuel will continue to be procured through the DFSC. Fuel deliveries to the base will be either by tank truck or through the Yellowstone Pipeline Company service line. The 6-inch steel line runs from the Yellowstone terminal to the bulk petroleum products storage yard at Malmstrom AFB.

Energy Conservation/Alternative Resources.

State of Montana. The Montana Department of Natural Resources and Conservation established the Conservation and Renewable Energy Bureau in the mid-1970s in response to the oil embargo and national energy crisis. The bureau administers programs funded by the U.S. Department of Energy, the Bonneville Power Administration (BPA), and with revenues generated by the state coal-severance tax. The goals of the bureau are to reduce energy consumption in the residential, commercial, government, and agriculture sectors through the use of energy efficient technologies and renewable energy resources.

Under a federal program, the state provides residents with technical assistance and economic information on energy conservation, with concentration on documentation of actual energy savings. The Energy Extension Service (EES) concentrates its efforts on

energy management and conservation for small energy users by operating information centers for distributing energy publications and providing alternative financing projects. The EES also conducts an Institutional Conservation Program (ICP) that awards matching funds to schools, hospitals, local governments, and public-care institutions for energy conservation measures. In FY 1986, ICP awarded a total of $357,042, including $5,429 (1.5% of the total) to the Great Falls School District, and $4,659 (1.3% of the total) to the Conrad School District. These funds were matched with equal funds from the participating school districts.

Programs funded by BPA include technical assistance programs for the residential, commercial, agriculture, and local-government sectors as part of an effort to obtain necessary power in the Pacific Northwest for the next 20 years. Montana's coal-severance tax funds two energy programs, a renewable energy grants and loans program and a state buildings energy program. In 1985, the state buildings energy program was expanded to include energy retrofit grants. A total of $287,528 in state funds have been awarded under this program, matched with an additional $130,127 in federal and grantee funds.

Montana Power Company. The 1978 Public Utility Regulatory Policy Act requires electric utility companies to purchase power from independent power producers (Qualifying Facilities [QF]) at an avoided cost (i.e., the utility's savings based on the cost to buy the power elsewhere or produce the power itself). In Montana, the rate that MPC is required to pay is set by the Public Service Commission. The MPC forecasts that 282 MW of QF resources, including wind, small hydro, and cogeneration, will be made available during the 1986 to 2009 planning period. This is a 780-percent increase from the 1984 forecast of 36 MW.

In addition, the MPC also includes forecasts for programmatic conservation. This is provided by the company's electric customers through participation in the company's Electric Conservation Purchase Plan and/or the Street and Area Lighting Electric Conservation Program. These plans are designed to achieve savings in the residential, commercial, industrial, local-government, and irrigation sectors, and from street and area lighting customers through the use of retrofits for existing structures and devices. As a result of these programs, the company forecasts annual savings between 26 and 49 MW by 1995.

Malmstrom Air Force Base. The Energy Management and Control System onbase monitors and controls facility heating, ventilation, and air conditioning in 39 buildings. The FY 1986 Military Construction Program budget includes the addition of 21 buildings to the system, and upgrading the systems in 23 of the existing 39 buildings. The new system will be able to monitor points at 816 locations onbase.

3.3 Transportation

Deployment of the Small Intercontinental Ballistic Missile (ICBM) system would generate additional travel demand during the construction and operations phases. Increases in travel demand would be in the form of increased passenger vehicle commuting, additional construction vehicle and heavy equipment movements to the sites, program-related traffic during the operations phase, and increased traffic in urban centers. As a result, potential problems may include increased congestion; increased travel and shipment times; decreased safety, comfort, and convenience; insufficient road right-of-way; and increased utilization of terminal and control facilities.

3.3.1 Resource Description

The transportation resource includes the various facilities used for the safe and efficient movement of persons and materials from place to place, the traffic associated with these facilities, and the ancillary facilities required for operation. The transportation resource elements include roads, public transportation, railroads, and commercial airports.

In the Legislative Environmental Impact Statement (LEIS), only regional interstate and primary highways, railroads, and airports were considered. In this Environmental Impact Statement (EIS), the site-specific analysis also addresses urban roads, secondary and local county roads, public transportation, railroads, and local area airports.

3.3.1.1 Roads

Roads include all interstates, Federal-Aid designated primary and secondary U.S. or state-numbered highways, county-maintained roads, and Federal-Aid designated urban roads. Of particular importance in the transportation analysis are the roads to be used for transportation of Hard Mobile Launchers (HMLs) and other program-related traffic, and the potential effects on traffic flow around areas where road and bridge improvements will be undertaken.

3.3.1.2 Public Transportation

Public transportation includes all facilities provided for the movement of passengers and their incidental baggage within the main population areas, on either fixed or contracted routes. Buses and taxis are the most common public transit services available in the Montana study area.

3.3.1.3 Railroads

Railroads include all facilities utilized for the movement of passengers and freight on rail lines. These consist of the rolling stock and terminal and control facilities.

3.3.1.4 Airports

Airports consist of all facilities utilized for the airborne movement of passengers and freight. These facilities include aircraft landing facilities, terminal buildings, navigational control systems, and ground vehicle access facilities. Only major area airports that serve potentially affected areas were considered in the study.

3.3.2 General Analysis Methodology

3.3.2.1 Region of Influence

The Region of Influence (ROI) for transportation includes all potentially affected transportation elements in the Montana study area such as highways, principal arterials, public transportation routes, railroads, and airports. The geographic boundary of the ROI is defined by the construction sites for the Small ICBM program, which include onbase construction areas and the affected launch facilities, roads, and operations areas. The ROI encompasses all major transportation systems affected by the movement of construction personnel, equipment, and materials to the construction sites. The ROI also includes locations where additional transportation facilities will have to be provided to serve the direct and indirect program-induced population. As shown in Figure 3.3.2-1, the ROI for transportation is located within the nine counties of Cascade, Chouteau, Fergus, Judith Basin, Lewis and Clark, Pondera, Teton, Toole, and Wheatland, all in Montana. The transportation ROI for this analysis is basically the same as that studied in the LEIS.

3.3.2.2 Roads

Roads were identified by their physical features and estimated level of service (LOS). The LOS, which is specified by letter scores A to F, is a qualitative measure that incorporates the collective factors of speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience, and operating costs provided by a road facility under a particular volume condition. Figure 3.3.2-2 illustrates the operational characteristics for the six LOS scores in a basic freeway segment, and Table 3.3.2-1 lists typical conditions of each letter score along a freeway, multilane road, two-lane highway, or an urban arterial street. The estimated LOS values were based on historic traffic volumes, including both passenger cars and heavy vehicles, and available road descriptions.

Future conditions on rural roads were projected by considering traffic changes to be proportional to countywide population changes. Future traffic volumes on interstate and primary highways connecting major population centers were estimated using statewide population changes. Population changes were derived from the socioeconomics resource. Travel demand in the Great Falls urban area was assessed by developing a computerized transportation model to simulate existing traffic conditions. Population, employment, housing units, and vehicle registration forecasts were obtained and analyzed. Future planned missions at the base, including the KC-135R air refueling mission, were considered in the analysis. The approach followed procedures outlined in the National Cooperative Highway Research Program Report 187, Quick Response Urban Travel Estimating Techniques and Transferable Parameters. The LOS and capacity analyses at critical intersections and principal arterials in Great Falls, Lewistown, Conrad, and on deployment area roads were performed for traffic conditions for the years 1990, 1995, and 2000.

3.3.2.3 Public Transportation

Public transportation services were characterized by size of fleet, types and extent of service, frequency of service, ridership, and potential for expansion. Future conditions were obtained from information provided by transit officials.

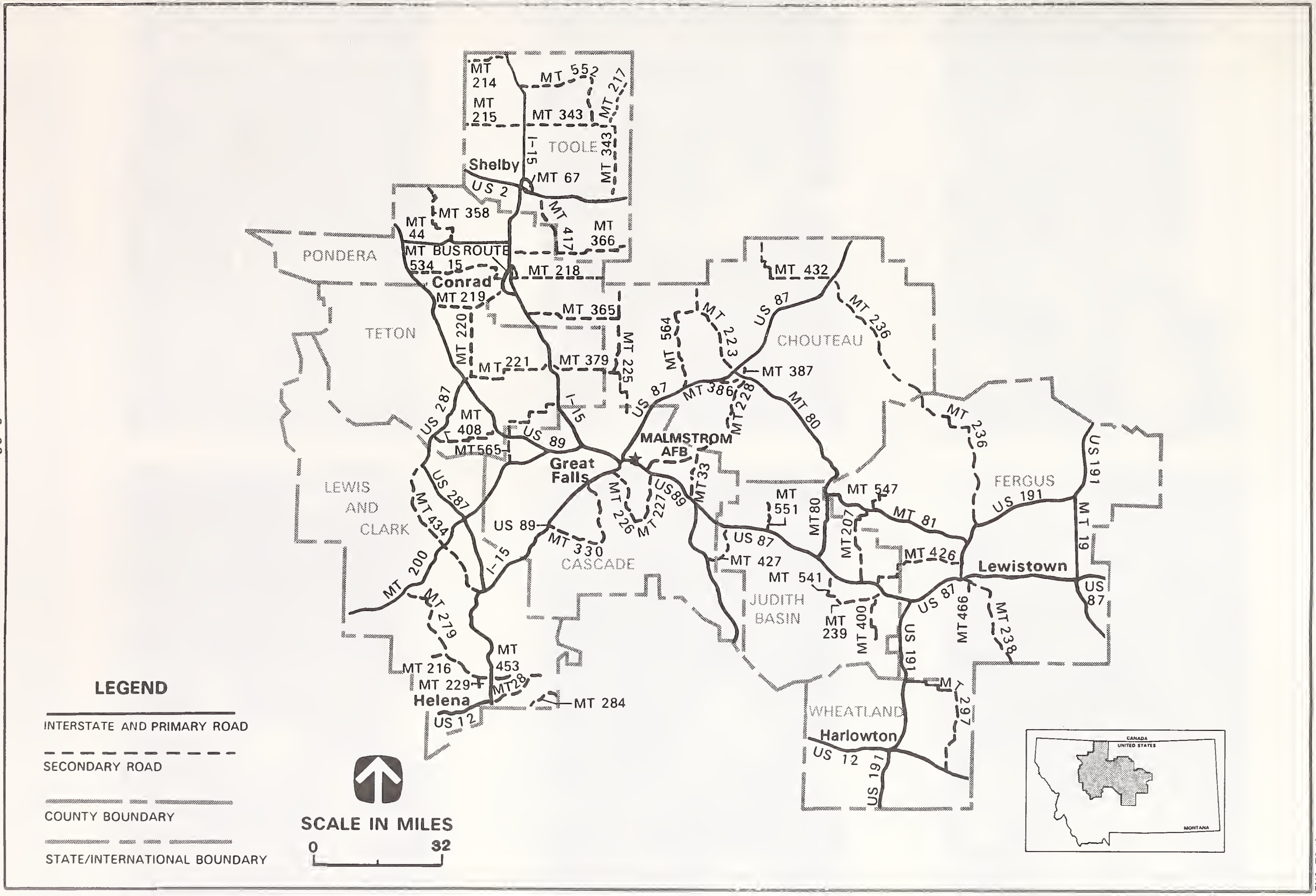
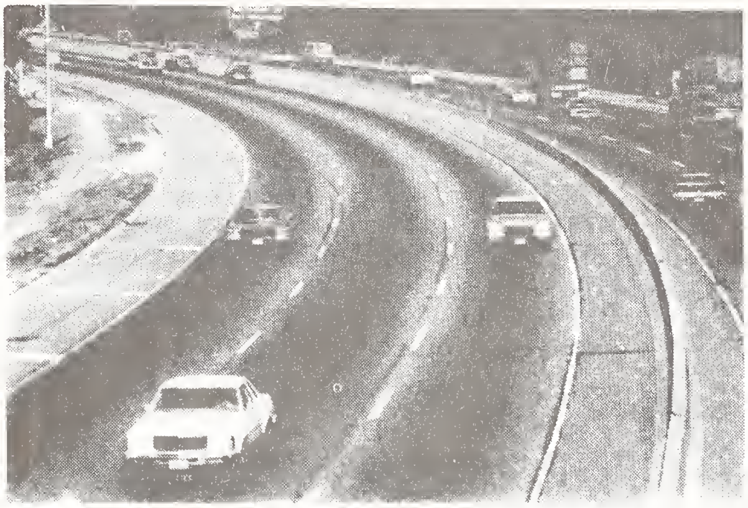


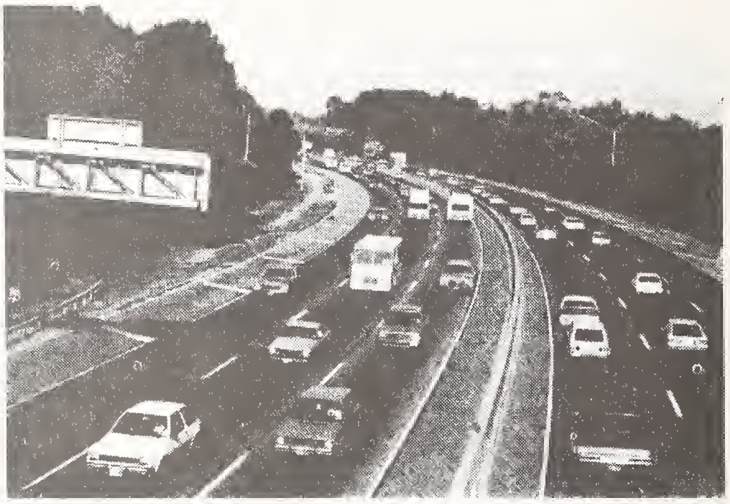
FIGURE 3.3.2-1 REGION OF INFLUENCE FOR TRANSPORTATION



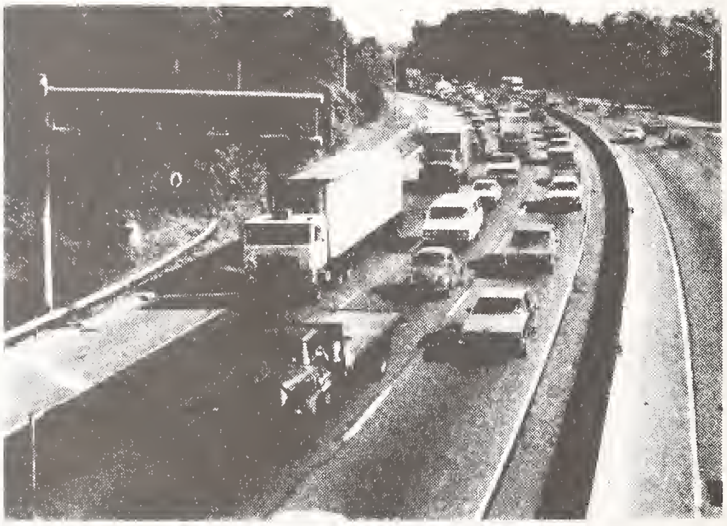
LEVEL OF SERVICE A

LEVEL OF SERVICE B

LEVEL OF SERVICE C



LEVEL OF SERVICE D



LEVEL OF SERVICE E

LEVEL OF SERVICE F

Source: Transportation Research Board 1985.

FIGURE 3.3.2-2 OPERATIONAL CHARACTERISTICS AT VARIOUS LEVELS OF SERVICE

TR2/37 EM3-TR/3

Table 3.3.2-1

General Operating Conditions For Different Road Types by Level of Service

Level of Service	Operating Conditions: Freeways, Multilane Highways	Operating Conditions: Two-Lane Roads	Operating Conditions: Arterial Streets
A	Traffic essentially free-flowing. Speeds about 60 mph[1]. Great freedom to maneuver. Minor disruptions easily absorbed.	Motorists can drive at desired speed, often about 60 mph[1]. Passing demand well below capacity; delays no more than 30%. Few platoons of 3 or more cars.	Free flow operations at average travel speeds usually about 90% of the free-flow speed for the arterial class. Vehicles are completely unimpeded in their ability to maneuver within the traffic stream. Stopped delay at signalized intersection is minimal.
B	Reasonably free flowing, speeds about 57 mph. Maneuvering slightly restricted. High comfort. Incidents still easily absorbed.	Passing demand significant; delay about 45%. Speeds near 55 mph. Some platooning.	Reasonably unimpeded operations at average travel speeds usually about 70% of the free-flow speed for the arterial class. The ability to maneuver within the traffic stream is only slightly restricted and stopped delays are not bothersome. Drivers are not generally subjected to appreciable tension.
C	Stable flow, speeds in low 50s. Lane changes require care and vigilance. Noticeable driver tension. Incidents cause degraded service, queuing.	Noticeable increases in numbers and sizes of platoons; delay about 60%. Speeds in low 50s. Stable flow, but subject to congestion.	Stable operations, but ability to maneuver and change lanes in midblock locations may be more restricted than LOS B, and longer queues and/or adverse signal coordination may contribute to lower average travel speeds of about 50% of the average free-flow speed for the arterial class. Motorists will experience an appreciable tension while driving.
D	Conditions border on unstable flow; small changes cause substantial deterioration in service. Speeds in low 40-mph range. Severe restrictions on maneuver, driver discomfort. Most disruptions cause LOS F.	Passing demand high, passing capacity near zero. Speeds may reach 50 mph. Platoons of 5-10 vehicles common. Delays may reach 75%. Approaches unstable flow.	Borders on a range in which small increases in flow may cause substantial increases in approach delay and hence, decreases in arterial speed. This may be due to adverse signal progression, inappropriate signal timing, high volumes, or some combination of these. Average travel speeds are about 40% of free-flow speed.
E	Conditions extremely unstable. No usable gaps; disruptions propagate upstream. Driver comfort, maneuverability extremely poor. Disruptions cause rapid transition to LOS F.	Passing virtually impossible; platooning intense, delays greater than 75%. Speeds below 50 mph, operation very unstable.	Characterized by significant approach delays and average travel speeds of one-third the free-flow speed or lower. Such operations are caused by some combination or adverse progression, high signal density, extensive queuing at critical intersections, and inappropriate signal timing.
F	Forced or breakdown flow.	Heavily congested flow, volumes below capacity at low speed.	Arterial flow at extremely low speeds below one-third to one-quarter of the free-flow speed. Intersection congestion is likely at critical signalized locations, with high approach delays resulting. Adverse progression is frequently a contributor to this condition.

Note: [1]In the absence of strict enforcement.
Source: Transportation Research Board 1985.

3.3.2.4 Railroads

The general characteristics of railroads within the region were evaluated. Existing and planned conditions of the rail network, including its rolling stock, rail yard capacity, freight hauled, and availability of lines to access program sites, were considered. The possibility of abandoning specific sections, where indicated in state railroad plans, was noted where pertinent. The ROI for railroads is shown in Figure 3.3.2-3.

3.3.2.5 Airports

Commercial airports were characterized by their location, type of service, commercial airline and general aviation aircraft served, terminal and landing facilities, parking, and other services provided at the airport. Future conditions and planned improvements or expansions, as indicated in the airport's master plan or the state airport system plan, were included. The ROI for airports is shown in Figure 3.3.2-3.

3.3.3 Existing and Future Baseline Conditions

3.3.3.1 Roads

City of Great Falls. The Great Falls urban area is configured in a grid type network of north-south and east-west roads, as shown in Figure 3.3.3-1. Most of the major roads in Great Falls are two lanes except 10th Avenue South and Central Avenue West, and sections of 6th Avenue West, 1st Avenue South, 2nd Avenue North, 57th Street, Northwest Bypass, 3rd Street West, Smelter Avenue, 10th Street North, and 25th Avenue Northeast; these are all four lanes.

Most of the major arterial or Federal-Aid designated urban routes within Great Falls provide operation at LOS A or B except along sections of Central Avenue, 1st Avenue North, and 2nd Avenue North within the central business area where service levels are LOS C or D. Traffic flow is also reduced along 10th Avenue South (which is part of U.S. 87/89) between River Drive and 38th Street where service levels are at LOS D or E during peak hours. Estimated service levels due to normal traffic increases without the program are not expected to change, or at most, drop by one level in the years 1990 through 2000.

Part of the Great Falls transportation improvement plans that may influence future travel patterns include:

- The reconstruction of the bridge on 10th Street North into a four-lane structure either along the existing alignment or along a new alignment to tie-up with 9th Street;
- The construction of the south arterial Bypass from the Gore Hill interchange of Interstate 15 to the intersection of 10th Avenue South and 57th Street;
- The construction of an interchange at 10th Avenue South and 14th Street Southwest;
- The improvement of 1st Avenue North Bridge approaches and the installation of signal lights;

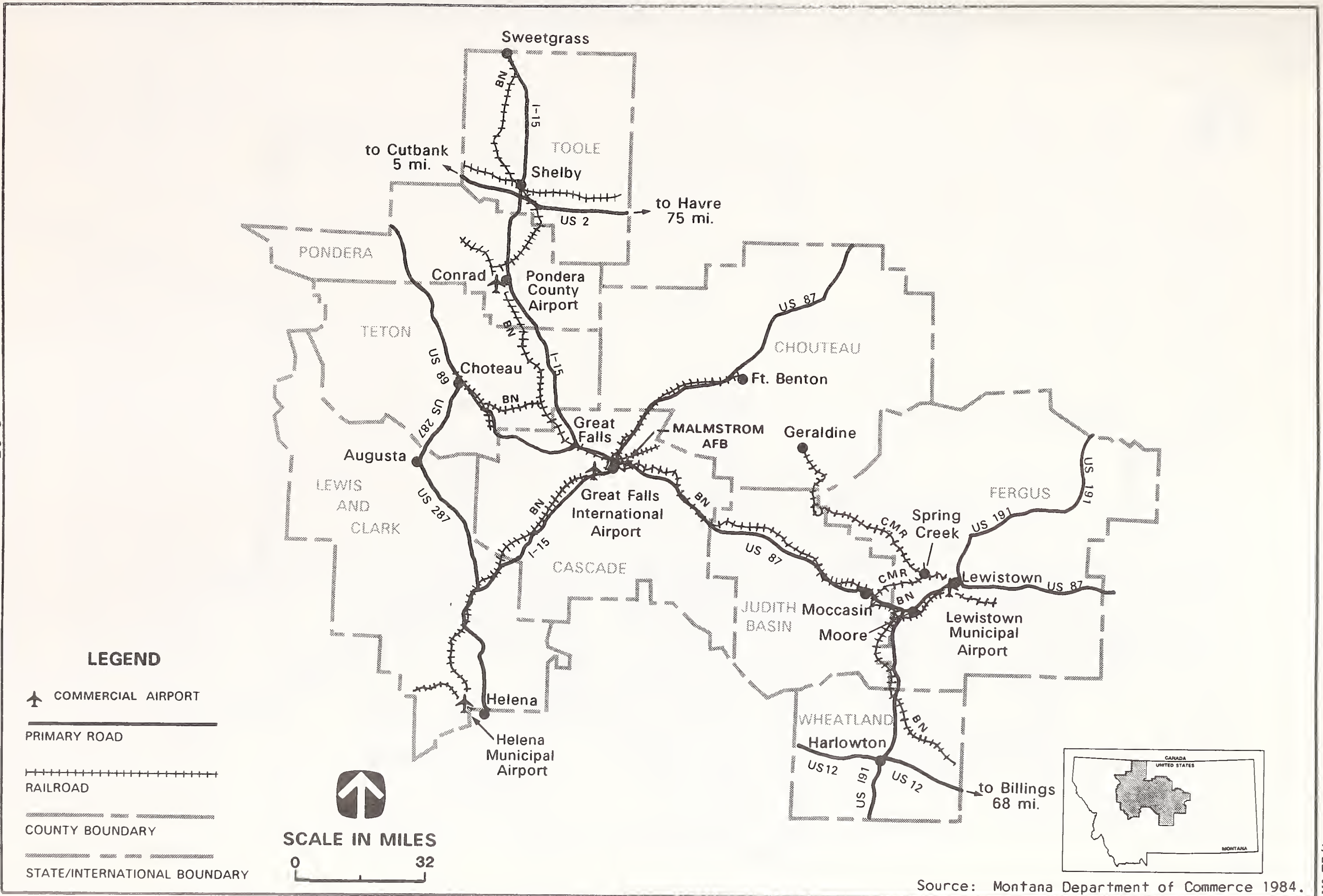


FIGURE 3.3.2-3 RAILROADS AND COMMERCIAL AIRPORTS WITHIN THE TRANSPORTATION REGION OF INFLUENCE

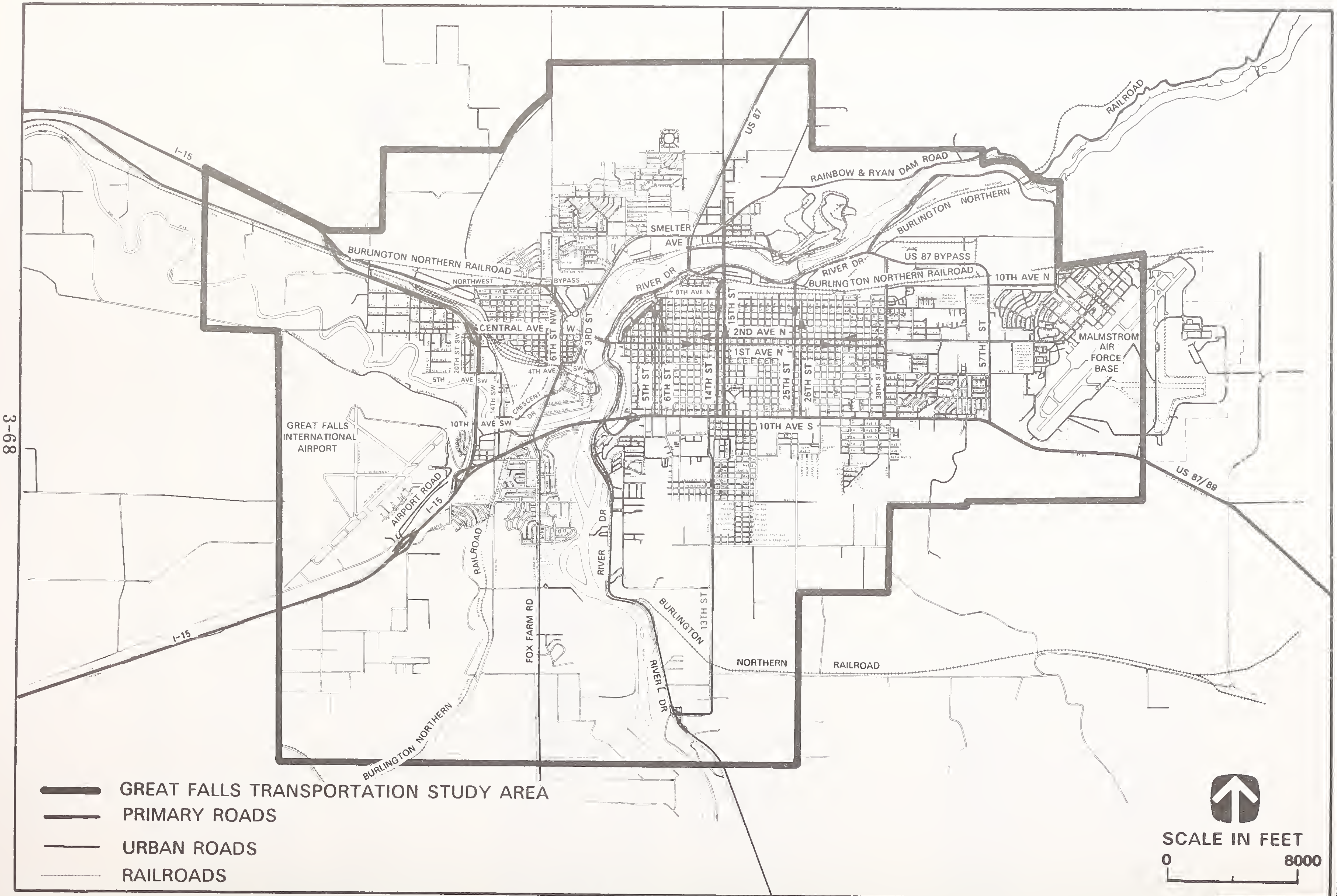


FIGURE 3.3.3-1 GREAT FALLS TRANSPORTATION NETWORK

- The improvement of Federal-Aid Urban Route 5203 (4th Avenue Southwest and 3rd Street Northwest from 6th Avenue to Central Avenue) in the northwest sector of the city;

- The installation of signal lights at the 14th Street and 15th Street intersections with 6th Avenue South; and

- The improvement of 2nd Street between 2nd Avenue South and 1st Avenue South and its side streets to complete a one-way couplet (1st and 2nd Avenues South) up to the Civic Center, and the installation of a traffic signal at the intersection of 2nd Street and 2nd Avenue South.

Malmstrom Air Force Base. Malmstrom Air Force Base (AFB) is located in north-central Montana, approximately 1.5 miles east of the city limits of Great Falls. The major roads within Malmstrom AFB include Goddard Avenue, 1st Street, 2nd Street, 5th Street, Avenue C, and Avenue G. Most of the base streets and roads were repaired and resurfaced during the fall of 1986. They are all two-lane roads and vary from a 42-foot to 54-foot right-of-way.

The 1985 average daily traffic (ADT) flow entering or leaving Malmstrom AFB by the main gate at 2nd Avenue North was 10,538 vehicles. The section of 10th Avenue North leading to the commercial gate had a 1985 ADT of 3,584. There are no significant congestion or problem areas except during the peak periods (7:30-9:00 A.M. and 3:30-5:00 P.M.) when occasional, short delays occur at the gate for those entering the base. (This is a result of vehicle registration and identification card checks by base security personnel.) The base, however, has a south gate along U.S. 87/89 which is used by military traffic commuting to the Weapons Storage Area and the eastern part of the base.

City of Lewistown. Lewistown is located in Fergus County, about 106 miles southeast of Great Falls. The major roads in the city include sections of primary highways U.S. 87 (Main Street), U.S. 87 Bypass (6th Avenue/1st Avenue), and U.S. 191 (Kendall Road); and Federal-Aid designated urban roads Boulevard Street; Spring Street; Casino Creek Drive; 5th Avenue; Brassey Street; Walnut Avenue; 1st, 4th, and 7th Avenues; Entrance Street; Wendell Avenue; and Mount Pleasant Avenue. These are all two-lane roads except for Main Street and a section of 1st Avenue, which are four lanes. Traffic along Main Street varies between 5,410 and 6,770 average annual daily traffic (AADT), along 1st Avenue (part of U.S. 191) between 6,040 and 7,360 AADT, and along Boulevard Street from 1,750 to 1,860 AADT, which results in peak-hour flow conditions of LOS B, LOS C, and LOS A, respectively. Service levels at other major arterial or Federal-Aid designated urban routes within Lewistown are at LOS A.

There are no proposed programs that would affect the service levels along the arterial routes in Lewistown. Estimated service levels due to normal traffic growth without the program are not expected to change between the years 1990 and 2000.

City of Conrad. Conrad is located in Pondera County, approximately 60 miles northwest of Great Falls. The major roads in the city include Main Street (which is also designated as Business Route 15), 4th Avenue (which is part of Federal-Aid Secondary Road 534), and Solid Road (which is part of Federal-Aid Secondary Road 218). These major roads are all two lanes with moderate amounts of traffic flow. The AADT in 1985 was 6,890 along Business Route 15 between 4th and Central Avenues, and 1,434 along 4th Avenue west of Main Street. This results in peak-hour flow conditions of LOS B along Business Route 15 and LOS A along 4th Avenue.

There are no proposed programs that would affect the service levels along the arterial routes in Conrad. Estimated service levels due to normal traffic growth without the program are not expected to change between the years 1990 and 2000.

Deployment Area Roads. The road network within the nine counties that comprise the ROI consists of 14,864 miles of U.S., state, and county roads, and city-owned streets (Table 3.3.3-1). The network consists of an interstate, 17 Federal-Aid primary routes, and 47 Federal-Aid secondary routes. Figure 3.3.2-1 (Section 3.3.2.1) shows the interstate and the various federal-aid designated primary and secondary U.S. and Montana-numbered roads within the ROI. The major highways that link the major cities include Interstate 15; U.S. 87, 89, and 191; and Montana State Highway 200.

There are a total of 1,707 miles of existing Minuteman transporter/erector (T/E) routes. The distribution and ownership of these roads are shown in Table 3.3.3-1. Most of these two-lane T/E routes are of asphalt (56%) and gravel (43%) surface. The distribution of surface type by county and by ownership is shown in Table 3.3.3-2. Traffic flows are mostly low, but moderate flows occur along primary and urban routes such as Interstate 15, U.S. 87 and 89, and their urban sections within Great Falls. This results in operations of LOS A along the T/E routes, except along U.S. 89 west of Vaughn (LOS C), along Montana State Highway 200 east of Simms (LOS B), and along U.S. 89 west of Belt (LOS B).

There are 315 bridges along the T/E route network including 30 bridges on redundant T/E routes. Nearly 44 percent of the bridges in the network are timber structures. All bridges have adequate vertical clearance for the HML and HML transporter vehicle. Most of the bridges are on interstate or primary highways. More than 93 percent are of simple span construction and more than 38 percent contain only one span. These are located in eight counties with Cascade and Fergus counties containing nearly 57 percent. Bridge distribution by location and type of road is shown in Table 3.3.3-3. Based upon the proposed HML configuration and operational requirements, 124 bridges have been identified as incapable of supporting the HML. They are located in seven counties as shown in Table 3.3.3-3.

A total of 3,308 culverts and 74 cattle guards have been identified along the T/E routes. The culverts are classified by type and distributed by counties as shown in Table 3.3.3-3. Some 905 pipe culverts along T/E routes were found to have less than 2 feet of cover. Another 31 box culverts have less than 2 feet cover. Of the 74 cattle guards located along the T/E routes, one is on an interstate ramp (I-15) in Cascade County, one is on a secondary road in Wheatland County, and the remaining 72 are on local county roads.

A 4-mile section of U.S. 87/89 from the U.S. 87 Bypass (10th Avenue South and 57th Street South intersection) to the Montana State Highway 227 and 228 intersection (Highwood and Sand Coulee/Stockett intersection) is planned for major upgrade and reconstruction. The proposed improvement is to widen the existing two-lane road into a divided four-lane highway.

Population projections show an increase for Cascade, Fergus, Lewis and Clark, and Pondera counties, whereas the population will remain the same or decrease for all other counties. Consequently, normal traffic changes between the years 1990 and 2000 are not expected to reduce the quality of service lower than the current LOS along the rural roads.

Table 3.3.3-1

Transporter/Erector Route Mileage by County and Ownership

	T/E Route Mileage				Total Road Mileage			
	State[1]	County	City	Total	State[1]	County	City	Total
Cascade	150.5	172.5	7.7	330.7	197.5	1,798.7	61.5	2,057.7
Chouteau	7.2	27.3	0	34.5	119.1	2,821.3	0	2,940.4
Fergus	163.4	244.2	0.3	407.9	229.2	1,732.5	10.1	1,971.8
Judith Basin	78.1	132.3	0	210.4	77.5	1,133.9	0	1,211.4
Lewis & Clark	37.5	37.8	0	75.3	171.8	1,474.1	28.7	1,674.6
Pondera	56.2	177.2	0	233.4	84.9	1,246.9	0	1,331.8
Teton	51.3	179.3	0	230.6	90.7	1,585.9	0	1,676.6
Toole	18.9	43.5	0	62.4	89.5	1,258.3	0	1,347.8
Wheatland	45.6	76.5	0	122.1	79.4	572.2	0	651.6
TOTAL:	608.7	1,090.6	8.0	1,707.3	1,139.6	13,623.8	100.3	14,863.7

Note: [1]State roads include Federal-Aid interstate and Federal-Aid primary highways only.

Source: Montana Department of Highways 1985b (total road mileage only).

Table 3.3.3-2

Total Transporter/Erector Route Mileage by Surface Type, County, and Ownership

County	Ownership	Type of Surface				
		Concrete	Asphalt	Gravel	Dirt	Total
Cascade	State	13.2	137.3	0	0	150.5
	County	0	57.9	114.6	0	172.5
	City	0	7.7	0	0	7.7
Chouteau	County	0	7.2	27.3	0	34.5
Fergus	State	0	163.4	0	0	163.4
	County	0	41.9	202.2	0.1	244.2
	City	0	0.3	0	0	0.3
Judith Basin	State	0	78.1	0	0	78.1
	County	0	28.6	102.7	1.0	132.3
Lewis & Clark	State	0	37.5	0	0	37.5
	County	0	19.5	18.3	0	37.8
Pondera	State	0	56.2	0	0	56.2
	County	0	75.3	101.9	0	177.2
Teton	State	0	51.3	0	0	51.3
	County	0	76.0	103.3	0	179.3
Toole	State	0	18.9	0	0	18.9
	County	0	28.3	15.2	0	43.5
Wheatland	State	0	45.6	0	0	45.6
	County	0	20.8	55.7	0	76.5
TOTAL:		13.2	951.8	741.2	1.1	1,707.3

3.3.3.2 Public Transportation

Public transportation service in Great Falls is provided by both buses and taxis. The Great Falls Transit District, which was established in May 1979 under provision of Montana State Law, started providing bus service in February 1982. The district is governed by a three-member board elected at large from within the district. It provides service within Great Falls and Black Eagle, Montana and offers two types of services: scheduled fixed route and chartered service. The buses operate between 6:00 A.M. and 6:30 P.M. on weekdays and between 9:30 A.M. and 5:30 P.M. on Saturdays. Currently, 13 buses operate during peak hours (with 30-minute headway between buses for each of the 7 fixed routes) and 7 buses (1 for each fixed route with a headway of 1 hr) during off-peak hours and Saturdays. In 1985, the system had an annual ridership of 485,000

Table 3.3.3-3

Transporter/Erector Route Bridges and Culvert Information by County

County	Distribution of Bridges					Distribution of Culverts				
	Along FAI[1] & FAP[2] Roads	Along FAS[3] & Local Roads	Along FAU[4] Roads	Total Bridges	Bridges Scheduled for Improvement	Corrugated Metal Pipe	Reinforced Concrete Pipe	Box Culverts	Total Culverts	Number of Cattle Guards
Cascade	64	26	1	91	31	330	267	18	615	7
Chouteau	0	0	0	0	0	27	12	2	41	0
Fergus	64	23	1	88	41	712	217	6	935	35
Judith Basin	22	2	0	24	16	328	120	10	458	4
Lewis & Clark	15	9	0	24	8	82	103	4	189	5
Pondera	17	19	0	36	12	408	46	0	454	0
Teton	21	15	0	36	11	207	165	3	375	11
Toole	4	1	0	5	0	62	19	0	81	0
Wheatland	8	3	0	11	5	120	38	2	160	12
TOTAL:	215	98	2	315	124	2,276	987	45	3,308	74

Notes:
[1] FAI - Federal-Aid interstate.
[2] FAP - Federal-Aid primary.
[3] FAS - Federal-Aid secondary.
[4] FAU - Federal-Aid urban.

sengers or an average weekday ridership of 1,750 passengers, and on Saturdays, an average ridership of 850 passengers. There are no plans to increase fleet size or to extend bus routes in the future.

Taxi service in Great Falls is provided by the Diamond Taxicab Company, a privately owned company that operates on an on-call basis 24 hours a day. It operates between six to eight taxis a day and charges fares between $3 to $10 on a zone basis. No local bus and taxi services are available within the cities of Lewistown and Conrad.

3.3.3.3 Railroads

Two major rail lines provide service in the area, the Class I Burlington Northern Railroad (BN) and the Class III Central Montana Rail (CMR). Rail passenger service is provided across northern Montana by Amtrak's Empire Builder which passes through Havre, Shelby, and Cut Bank (Section 3.3.2.2, Figure 3.3.2-3). Passenger service is provided 3 days per week in each direction. The BN operates the north-south main freight line between Billings and Sweetgrass at the Canadian border, passing through Moccasin, Great Falls, Conrad, and Shelby. Another main freight line passes from Helena through Great Falls to Havre, but this line is discontinuous because a section was abandoned due to landslides north of Fort Benton. The primary commodities carried on the Great Falls to Fort Benton line are farm products (97%) and fertilizer and machinery (3%). The BN maintains a marshaling and maintenance yard in downtown Great Falls and a branch line from this yard extends north and east through the city and terminates just northwest of Malmstrom AFB. This is a light-density line that carries ordnance and commodities to the base. It was reconstructed and upgraded during the 1985 to 1986 construction season.

In the Lewistown area, a branchline extends from Sipple near the BN mainline to Lewistown. This line provides essential rail service to Lewistown, an important population center in central Montana. The BN has agreed to extend the line between Sipple and Moore in 1985. This will allow the BN to provide service into Lewistown without investing in costly rehabilitation on the existing line between Moccasin and Lewistown, which is scheduled for abandonment. A variety of commodities are shipped to and from the Moore and Lewistown areas. Grain, wood chips, and wood products account for over 95 percent of the traffic.

The CMR was formed to preserve rail service to central Montana on a 66.1-mile branch line that was abandoned by the BN after being acquired from the Milwaukee Road. This CMR line extends southeast from Geraldine to Spring Creek Junction and then proceeds west to Moccasin, which is on the BN mainline. The primary commodity moved on this line is grain, though occasional shipments of fertilizer and machinery also occur. A multiphase operations and rehabilitation project has been proposed for the segment between Spring Creek and Geraldine at an estimated cost of $9.4 million. In the near future, the line between Moccasin and Spring Creek Junction will have to be upgraded. About 1,000 ties per mile will be replaced to stabilize the line. This line, which is operated by Central-Montana Railroad (CMR), is still owned by the Burlington Northern (BN) Railroad who is responsible for its maintenance. However, after the Moore-Sipple connection is built, the BN will abandon the Moccasin-Spring Creek section and donate it to the state. The state will then lease this section to the CMR.

3.3.3.4 Airports

The region is serviced by airports located in Great Falls, Lewistown, and Conrad.

Great Falls International Airport. Located about 3 miles southwest of downtown Great Falls, Great Falls International Airport is the largest air carrier airport in north-central Montana. It is operated by the Great Falls International Airport Authority. Four major airlines, Northwest Orient, Delta, Continental, and United, currently serve the airport. Smaller regional carriers, Northwest Airlink (formerly Big Sky Airlines), and Horizon Air, also serve the airport. Eighty-five civil aircraft are based at the airport; 64 are single-engine propeller aircraft and account for about three-fourths of the total number. Piston-prop multiengine aircraft (18) account for an additional 21 percent. In addition, one turbo-prop aircraft and two business jets are based at the airport.

The airport has three active runways: Runway 3-21, the primary instrument runway used by the air carriers, general aviation, and the military; Runway 16-34, a crosswind runway used primarily by general aviation and occasionally by the air carriers and the military; and Runway 7-25, used exclusively by general aviation for convenience and during crosswind conditions. The passenger terminal building, which was completed in 1975, has about 120,000 square feet on two levels and four air carrier aircraft gate positions. The concourses are designed to permit additional gate positions at each end, as well as permit extension if more gate positions are needed. All existing gates have sufficient space for narrow-body jet aircraft (such as the B-737 and B-727), and Gate 1 is already equipped with a flexible passenger loading bridge that can serve wide-body jet aircraft such as the B-767 and DC-10.

The existing surface vehicle parking lot in front of the terminal building provides 439 public parking spaces. The lot is divided to accommodate 87 short-term parking and 352 long-term parking spaces. Overflow parking, which is sometimes needed during the peak-holiday season, is provided around the periphery of the long-term lot and can accommodate about 20 more vehicles. The primary access to the airport is through Airport Road (Federal Aid Urban Route 5212), which is connected by a diamond interchange to Interstate 15.

Other facilities at the airport include those for air cargo, mail, and the military. Nearly all of the air cargo and mail handled at Great Falls International Airport are carried in the baggage compartment of passenger airlines. However, two all-cargo operator/freight express companies, United Parcel Service and Federal Express, currently operate at the airport and use the general aviation apron at the northeastern end of Runway 3-21 for loading and unloading cargo. The Montana Air National Guard currently leases about 125 acres of land southwest of the passenger terminal complex. Smaller areas of about 4 acres each are also leased by the U.S. Army Reserve Training Center and the U.S. Navy Reserve Training Center in the same vicinity. Military operations are primarily by F-16 aircraft, with occasional activity by F-4 aircraft. Twice a month, C-131s perform practice operations in the area for about 3 hours at a time.

The Airport Master Plan Update has determined that the existing runway system will be adequate to meet aviation demand through the year 2005. However, after 1990, additional taxiways are recommended to be built parallel to Runways 16-34, 7-25, and the northern end of Runway 3-21. The existing passenger terminal building has sufficient capacity to accommodate projected increases in passenger enplanements and air carrier aircraft operations. The structure is designed to accommodate additional gate positions

and the existing aircraft parking apron will not have to be enlarged. Public parking in the passenger terminal complex area is sufficient to meet the needs through 1990. However, a staged expansion of the existing parking lot for an additional 225 spaces has been planned between 1991 and 2005.

Lewistown Airport. Lewistown Municipal Airport, located approximately 3 miles southwest of the City of Lewistown, is a commuter airport which serves Fergus County and surrounding areas. Because of the proximity of Lewistown to Billings and Great Falls, the Fergus County air traveler is more likely to drive to a major boarding point as opposed to boarding in Lewistown. Northwest Airlink (Big Sky Airlines) serves Lewistown with two round trips every weekday from Billings and Havre.

The airport has three paved runways: the primary instrument Runway 7-25, a crosswind Runway 2-20, and the alternate Runway 12-30. Runway 7-25 has been proposed for resurfacing and extension by about 800 feet. The main access to the airport is via Federal-Aid Urban Route 7103, which connects directly to U.S. 87 or Main Street within Lewistown.

Conrad Airport. Conrad (Pondera County) Airport, located immediately west of the City of Conrad, serves mostly general aviation; that is, business, pleasure, and utility flying. During certain seasons of the year, agricultural spraying activity is conducted from the airport. Other seasonal activity, mostly during the summer months, involves instructional or touch-and-go flying by smaller, single-engine aircraft. Charter service, air ambulance activities, and, on rare occasions, forest administration, are other forms of aeronautical activities at Conrad.

The airport has a paved main runway (5-23) and a turf runway (14-32) which is used during crosswind conditions. There are two paved apron areas used for refueling by short-term transient aircraft and by a number of locally based aircraft. Terminal facilities include a hangar, an airport maintenance building, and an office trailer. The airport is accessed through federal-aid Secondary Route 534, which is 4th Avenue within the city limits. The existing roads and auto parking lot near the terminal area are gravel surfaced.

The Conrad Airport Master Plan has recommended the extension of Runway 5-23 to 4,600 feet and the construction of a parallel taxiway for increased safety and efficiency. Because of anticipated increases in demand for both itinerant and local-based aircraft parking and service requirements, additional paved apron and the reconstruction of existing apron areas with pavement section similar to the runway are programmed. Future airport access is planned via the existing gravel road that serves the county weed-control building. This proposed access road will provide better circulation in the terminal area and direct access to the proposed auto parking lot.

3.4 Land Use

Deployment of the Small Intercontinental Ballistic Missile (ICBM) at Malmstrom Air Force Base (AFB) would result in population increases that may require additional residential and associated commercial and public infrastructure development in the affected communities. It would also result in changes to rural land uses and potential disruptions or changes to agricultural management practices in the deployment area. To analyze these changes, the land use resource includes consideration of both urban and rural land uses.

3.4.1 Resource Description

The land use resource as discussed for this analysis is similar to that described in the Legislative Environmental Impact Statement (LEIS). The LEIS was a regional study that addressed land use at a general level. For this site-specific Environmental Impact Ssatement (EIS), land use is addressed in detail. The urban and rural land use elements focus on Malmstrom AFB, the launch facilities, and the transporter/erector (T/E) routes, together with a general study of the urban and rural areas of the region.

3.4.1.1 Urban Land Use

The study of urban land use addresses direct impacts resulting from construction of program-related facilities at or in the vicinity of the base, and indirect program impacts to the amount and types of developed and undeveloped land in urban areas. The program's consistency with adopted urban land use plans is also included.

3.4.1.2 Rural Land Use

The study of rural land use addresses the changes in land use caused by acquisition of land for proposed program use and the impacts from T/E route modifications, launch facility modifications, and establishment of required explosive safety zones around the launch facilities. It also addresses indirect impacts to agricultural management practices, including access to local roads and property and agricultural measures undertaken to improve crop and livestock values.

3.4.2 General Analysis Methodology

3.4.2.1 Region of Influence

The Region of Influence (ROI) for urban land use was based on the assumption that inmigration could lead to land use changes in the form of new residential development and development of associated support services and infrastructure. The ROI for the EIS has been reduced from the nine-county ROI used in the LEIS. The reduction is a result of the LEIS analysis and the current program description which indicates a potential for localized impacts. Therefore, the ROI includes Malmstrom AFB and the counties and communities where program-induced population inmigration is anticipated. The City of Great Falls in Cascade County is expected to be the largest recipient of program-related population increases. The communities of Lewistown and Conrad in Fergus and Pondera counties, respectively, are also likely to receive program-induced population growth.

The ROI for rural land use includes the nine counties where the Minuteman launch facilities are located and where direct and indirect land use impacts from the proposed program could occur. These counties are Cascade, Chouteau, Fergus, Judith Basin, Lewis and Clark, Pondera, Teton, Toole, and Wheatland.

3.4.2.2 Urban Land Use

Urban land use was evaluated in terms of the overall rate of development and the local capacity to absorb additional population. An urban land use inventory was conducted using existing data to determine the amounts of acreage in each major category. To understand urban growth rates, available data were analyzed to determine trends in annexation activity. Local interviews were conducted to supplement available documents and update development activities.

Existing planning documents were reviewed to identify major local land use issues and policies most relevant to the proposed program. An increased demand for mobile home sites may result in a large program-induced change in urban land use, since construction workers employed on temporary programs often prefer mobile homes to site-built homes. A detailed analysis of the number and locations of existing mobile home subdivisions and mobile home parks, together with the amount of spaces and vacancies, was performed. Areas available for recreational vehicles and trailers were also analyzed.

Future baseline conditions for urban land use focused on urban land development as a whole, rather than evaluating each urban land use component separately. Communities of varying sizes were analyzed using a systematic procedure that addressed local planning capabilities, access to service and facilities, and proposed development. The community comprehensive plans formed the basis for this analysis.

Future baseline land uses without the program were estimated. To estimate residential land use, the required change in supply of housing units, based on housing projections developed in the socioeconomic analysis, was multiplied by density factors determined from local conditions and practices using densities (i.e., units per acre) shown in Section 4.4.1.1. Vacant land absorption was determined for each community by considering historical trends and annexation policies. Land use changes anticipated as a result of KC-135R air refueling mission at Malmstrom AFB were incorporated in the future baseline estimates.

3.4.2.3 Rural Land Use

Land uses in the deployment area were identified through interpretation of aerial photographs and existing maps. The generalized pattern of agriculture (the predominant rural land use in the ROI) was determined and was further subdivided by type of use. Existing conditions were described in terms of the percentage of each land use occurring within the ROI.

Future baseline conditions assumed a continuation of existing conditions, except in specific locations undergoing conversion.

3.4.3 Existing and Future Baseline Conditions

3.4.3.1 Urban Land Use

The expansion of urbanized areas occurs through the utilization of vacant developable land and/or the redevelopment of existing urban areas. Urban growth is predicated on the basis that it occurs in a reasonable and logical manner. Developable vacant land should consist of land located within established urban areas and/or land contiguous to existing built-up areas. Developable vacant land should be reasonably free of serious

development constraints such as unstable ground, low-altitude flight patterns of air facilities, and floodplains. Prime agricultural farmlands should also be avoided where feasible. Urban expansion conducted according to these guidelines provides services including roads, utilities, and other urban services (e.g., police and fire) at the most economical cost. The land use analysis for the communities of Great Falls, Lewistown, and Conrad was conducted using these principles.

The State of Montana requires all incorporated cities and their associated counties to establish a city-county planning agency. The planning area is to encompass an area at least 4 miles out from the corporate boundaries of the city. The outer land away from the city usually consists entirely of open space uses such as agriculture, with sparsely settled rural populations located in isolated farmhouses. Therefore, the planning agency usually stipulates that developable vacant land uses occur within the unincorporated land closest to the city limits.

City of Great Falls. Great Falls contains approximately 10,860 acres within the city's corporate boundaries; 69 percent is devoted to residential purposes. An unincorporated area of approximately 28,200 acres surrounds the city. This unincorporated area including the Malmstrom AFB and the surrounding land within 1 mile of the base, comprises the study area for the land use analysis. Relevant data for this study area are presented in Table 3.4.3-1.

The unincorporated part of this area excluding Malmstrom AFB contains approximately 1,700 acres devoted to residential uses. Most of the structures occur on large parcels of land (0.5 acre or larger) and are served by onsite individual sewage systems. Residential developments served by community sewage systems generally occur on individual parcels (0.25 acre or smaller). Malmstrom AFB occupies 3,163 acres; the remaining area of unincorporated land is devoted generally to agriculture and other types of open-space activities.

Table 3.4.3-1

Land Uses in the Great Falls Urban Area and Malmstrom AFB 1986

Land Use	Great Falls Urban Area (acres)	Malmstrom AFB (acres)
Single-Family Residential	6,629	0
Multiple-Family Residential	702	360
Commercial	997	28
Industrial	2,332	150
Public	3,231	332
Administrative	0	211
Flight Line	0	865
Ordnance Related	0	82
Agricultural/Rangeland	19,096	5,291[1]
Vacant Developable	6,118	1,135
TOTAL:	39,105	8,454

Note: [1]Lands located within 1-mile zone of the base.

An analysis of the land uses within the Great Falls urban area indicates that, in 1986, approximately 19 percent of the area was devoted to residential uses. Total expansion of residential acreage since 1978 has been approximately 2 percent. The development of vacant interurban areas has amounted to about 31 acres, whereas outside growth contiguous to the built-up areas has amounted to 61 acres. The largest outward growth has occurred on the south side of the city west of the Missouri River and on the east side between the city and Malmstrom AFB. The infill within the urbanized areas has occurred in the west section of the city.

The City of Great Falls and the Great Falls City-County Planning Board have adopted zoning ordinances, subdivision ordinances, and a comprehensive plan which includes a Land Use Plan, Transportation Plan, and Community Facilities Plan.

Malmstrom Air Force Base and Vicinity. Figure 3.4.3-1 illustrates the existing land uses of Malmstrom AFB and vicinity as of March 1986. Land on the north, east, and south of the base is rural and essentially uninhabited. The land is used for dry-cropland farming, with winter wheat the principal crop. The land to the west of the base is urban and includes both incorporated and unincorporated Great Falls. Land uses are mixed and include residential, commercial, and industrial, with a minor amount of schools, parks, and recreational lands. Vacant lands close to the base are located in an area both north and south of 2nd Avenue North and east of 46th Street South. Severe construction constraints in this area (e.g., poor drainage and expansive soils) may limit development unless expensive engineering practices are imposed, which may raise the cost of housing and infrastructural services (e.g., sewers and roads). The Air Force has prepared Phase I, Installation Restoration Program (hazardous waste) on January 1985 (JRB and Associates 1985). Phase II of this program is being formulated and is expected to be completed in late 1987. The results of this study could lead to additional land available for development onbase.

City of Lewistown. Lewistown contains 1,011 acres within the city's corporate boundaries; 61 percent is devoted to residential uses. The city/county planning area contains 13,975 acres, with residential land uses amounting to about 870 acres or 6.2 percent of this area. The Lewistown City-County Planning Department has prepared a draft zoning ordinance for this unincorporated area because it is thought to have the greatest potential for growth. Approximately 9,000 acres of the Lewistown City-County Planning Area is devoted almost entirely to rural land uses with a very sparsely settled population. Land uses in Lewistown planning area are presented in Table 3.4.3-2.

Since 1971, the residential land uses of Lewistown and the surrounding unincorporated area (about 414 acres) have expanded by about 454 acres, to about 868 acres. Most of the new development has been characterized by compact growth through development of new subdivisions and infill of existing areas. The unincorporated areas to the northwest and southwest of the city are characterized by past urban sprawl of low-density residential uses. These areas have received much infill of new residential development while expansion of the sprawl appears to have been kept to a minimum. New city annexations have incorporated much of the new growth in areas contiguous to the city. There is considerable vacant developable land located within the built-up areas of Lewistown; therefore, there should be continued encouragement to develop, by infill, the vacant areas prior to expansion outward from the urbanized area.

The City of Lewistown and the City-County Planning Board have adopted zoning ordinances, subdivision ordinances, and a comprehensive plan. A new comprehensive plan and a zoning ordinance are being formulated.

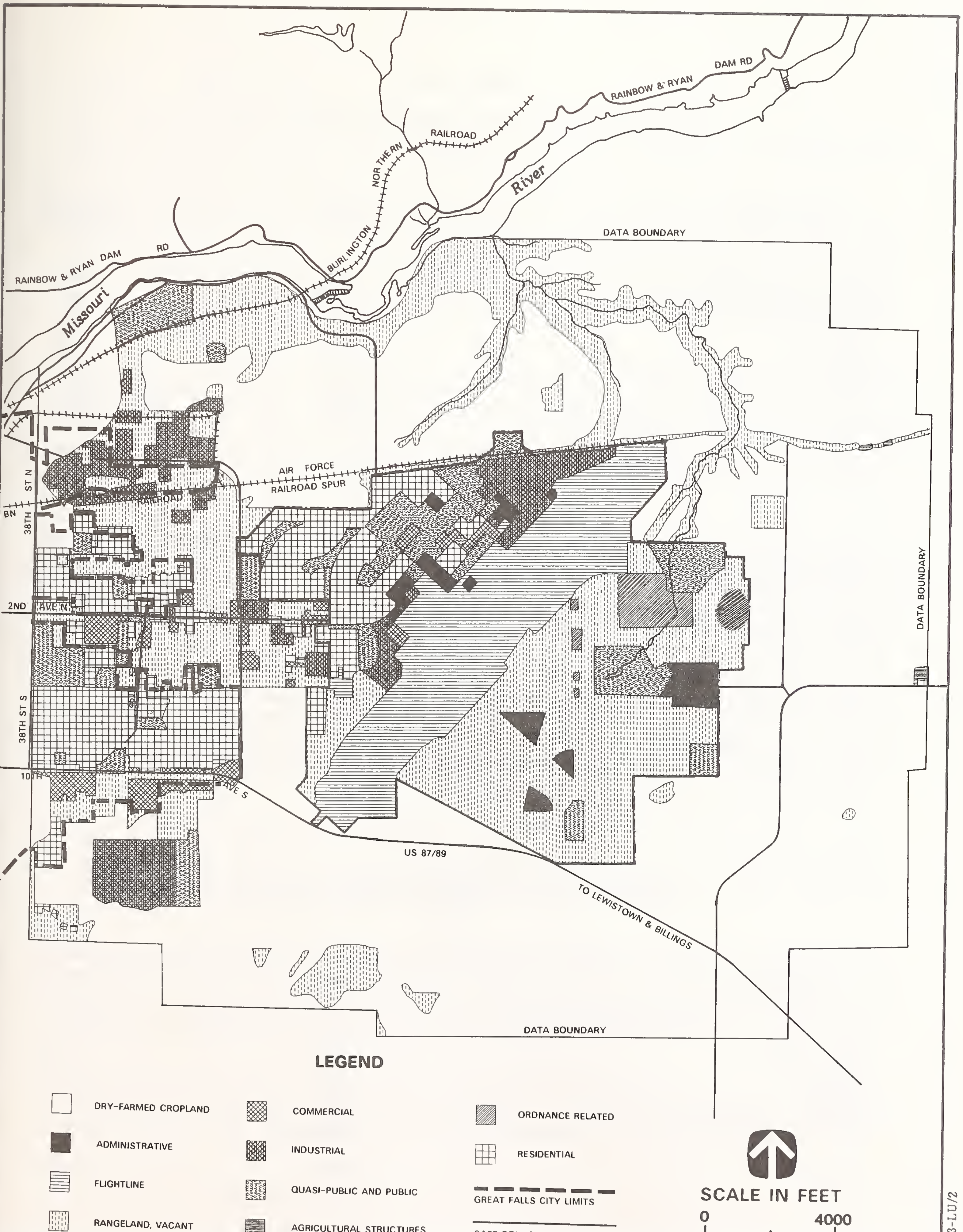


FIGURE 3.4.3-1 GENERALIZED URBAN LAND USE OF MALMSTROM AFB AND VICINITY, 1986

Table 3.4.3-2

Existing Land Uses in the Lewistown Planning Area
1986

Land Uses	Acres	Percent
Single-family residential	816	5.8
Multiple-family residential	52	0.4
Commercial	134	1.0
Industrial	259	1.9
Public	1,345	9.6
Vacant developable	2,300	16.4
Rural	9,069	64.9
TOTAL:	13,975	100.0

City of Conrad. Conrad contains 685 acres within the city's corporate boundaries; 365 acres (or 53%) are devoted to residential land uses. The Conrad-Pondera City-County Planning Board has included in their comprehensive plan an area 1 mile beyond the city limits, which has a very sparse rural population. The area mainly consists of isolated farmhouses, but also contains an eight-lot tract. The city experienced extensive development in the 1970s from the anticipated Antiballistic Missile program, which was never deployed. Therefore, there is considerable developed land available in the form of essentially vacant trailer parks. In addition, there is land available for infill prior to the need for development of vacant land in the unincorporated areas adjacent to the city. The City of Conrad and the City-County Planning Board have adopted a comprehensive plan, a zoning ordinance, and a subdivision ordinance. Existing land uses within the Conrad planning area are listed in Table 3.4.3-3.

Table 3.4.3-3

Existing Land Uses in the Conrad Planning Area
1986

Land Uses	Acres	Percent
Residential	392	6.7
Commercial	73	1.2
Industrial	466	8.0
Public	321	5.5
Vacant developable	435	7.4
Agricultural/Rangeland	4,168	71.2
TOTAL:	5,855	100.0

3.4.3.2 Rural Land Use

The analysis of the existing rural land use conditions focused on the T/E route corridors and the land surrounding each launch facility. The corridors are approximately 1,000 feet wide on either side of the T/E route centerline.

Generalized Land Use in the Region of Influence. Figure 3.4.3-2 and Table 3.4.3-4 present a generalized view of the rural land use in the ROI. The livestock industry utilized approximately 43 percent of the land in the ROI in the form of rangeland or pasture. Hay is used as winter feed for livestock. Cattle raising is the major livestock activity in the ROI. The sheep, horse, hog, and poultry industries, while present, are small compared to the cattle industry.

Dry-cropland farming constitutes the next largest type of land use activity in the ROI (Table 3.4.3-4). Dry-farmed crops generally include wheat and barley; however, wheat is the principal crop type. Winter wheat is planted during late summer and fall, usually between September 15 and October 25. Barley and spring wheat are planted in the spring between April 1 and May 15. Nonirrigated haylands are cut only once a season, usually in July. The harvesting of wheat and barley occurs from summer to early fall depending on weather conditions.

Irrigated agriculture (only 9% of the ROI) is an important land use in the area and has the highest value per acre when compared to the other agricultural land uses in the ROI. Hay is the principal crop grown on irrigated lands followed next by barley. Hay harvesting is conducted throughout the summer season, and two to three cuttings are possible on irrigated lands. Spring wheat is the principal type of wheat irrigated; however, its seeded acreages are about 75 percent less than the irrigated acreages of barley (Table 3.4.3-5).

The irrigated farms tend to have smaller acreages than the dry-cropped farms. Irrigation generally utilizes center pivot and roller-line sprinkler systems, though a substantial amount is through flood irrigation. The principal irrigation areas are along the Marias, Teton, Sun, and Musselshell rivers in Pondera, Teton, Cascade, and Wheatland counties. Some irrigation occurs in the other five counties as well.

Land identified as dry-farmed cropland or irrigated cropland includes land producing crops and land in a fallow condition. The grain farming in Montana requires a type of crop rotation where certain lands are left fallow. As a result, the acreage of farmland in the ROI differs from the acreage seeded. Weather conditions further result in the reduction of yields and acres harvested.

Both crop and livestock agricultural industries are dependent upon the road network of the area, which allows access of machinery and vehicles to cultivate, harvest, transport to market, and maintain the operation. Use of the road network is greatest during periods of cultivation and planting of crops, moving cattle to pasture, crop harvest, and transport of cattle and crops to market.

The rural areas of the ROI are characterized by small towns and hamlets of 1,000 people or less with isolated farmhouses; the livestock and dry-farmed areas have lower population densities when compared to the irrigated cropland areas.

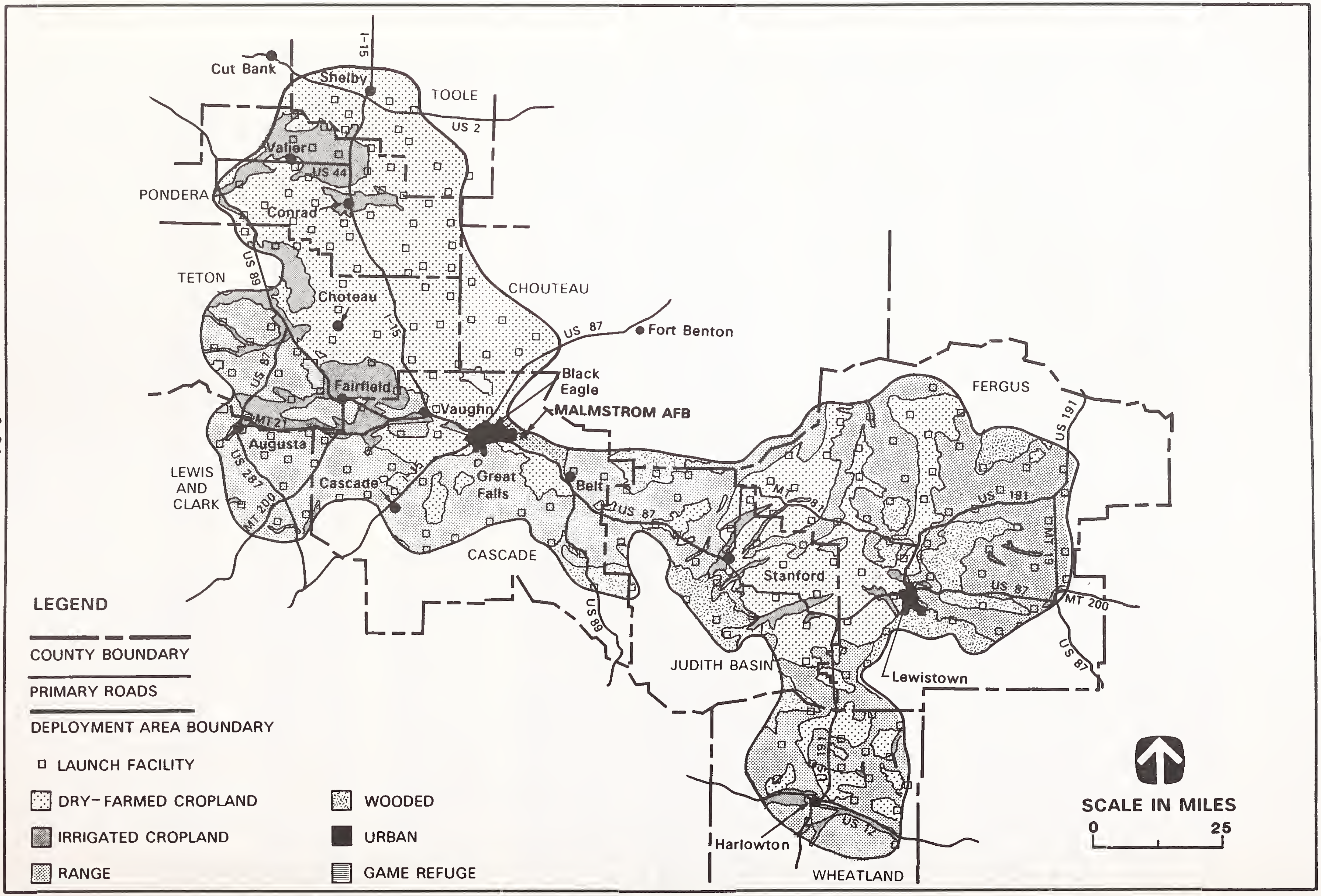


FIGURE 3.4.3-2 GENERALIZED RURAL LAND USE OF THE REGION OF INFLUENCE

EM3-LU/3

Table 3.4.3-4

Generalized Rural Land Use Within the Region of Influence, 1986

County[1]	Irrigated Cropland		Dry-Farmed Cropland		Range or Pasture		Wooded		Urban		Game Refuges		Water	
	Acres[2]	Percent of County	Acres	Percent of County	Acres	Percent of County	Acres	Percent of County	Acres	Percent of County	Acres	Percent of County	Acres	Percent of County
Cascade (1,098,100)	67,300	6	312,700	28	588,700	54	92,600	8	24,000	2	12,000	1	800	-
Chouteau (254,500)	0	0	193,700	76	30,000	12	30,800	12	0	0	0	0	0	0
Fergus (1,548,300)	29,800	2	515,500	33	938,600	61	57,500	4	6,900	-	0	0	0	0
Judith Basin (835,400)	49,700	6	309,000	37	332,700	40	144,000	17	0	0	0	0	0	0
Lewis and Clark (298,300)	10,900	4	0	0	280,200	94	4,600	1	0	0	2,600	1	0	0
Pondera (681,800)	181,000	27	488,600	72	7,600	1	0	0	0	0	0	0	4,600	1
Teton (988,000)	223,700	23	461,100	47	247,000	25	41,400	4	0	0	14,400	1	400	-
Toole (295,600)	1,900	1	289,800	98	0	0	0	0	0	0	0	0	3,900	1
Wheatland (543,800)	45,100	8	122,000	22	360,800	66	15,900	3	0	0	0	0	0	0
TOTAL: (6,543,800)	609,400	9	2,692,400	41	2,785,600	43	386,800	6	30,900	-	29,000	-	9,700	-

Notes: [1]Land uses within each county relate to the portions of the county located within the deployment area.
[2]Acres rounded to nearest 100.

Table 3.4.3-5

Dry-Farmed and Irrigated Cropland Statistics for the Region of Influence 1984

Land Use	Acres[1]	Percent
Dry-Farmed Cropland		
Winter wheat	986,000	39
Barley	886,000	36
Spring wheat (other than durum)	317,900	13
Hay	229,200	9
Durum wheat	42,500	2
Oats (includes both irrigated and dry-farmed acreage)	32,500	1
TOTAL:	2,494,100	
Irrigated Cropland		
Hay	172,400	60
Barley	85,700	30
Spring wheat (other than durum)	21,200	7
Winter wheat	6,200	2
Durum wheat	2,000	<1
TOTAL:	287,500	

Note: [1]Acres rounded off to the nearest 100.
Source: Montana Department of Agriculture 1986.

The remaining land use type in rural areas consists of woodlands and forests. Generally, the woodlands are located in the mountainous areas of the ROI and are usually managed by the U.S. Forest Service (Figure 3.4.3-2). Some of the woodlands contain areas of both protected forest and productive forest, where timber is harvested and forage-grazed.

Land Use Along Deployment Area Roads. The principal land uses as shown in Table 3.4.3-6 are dry-farmed cropland and rangeland, which together amount to 85 percent of the land within the corridors. Irrigated agriculture, amounting to only 9 percent of the corridor area, is an important land use because these lands are the most intensively developed of the agricultural areas and result in the highest yields per acre. Built-up lands, amounting to only 3 percent of the corridor area, are the areas where the population resides, works, and conducts commerce. The majority of them are rural in character but do include Great Falls, Lewistown, and Conrad. Other built-up or urban places consist of 8 Hutterite colonies (communal communities discussed in Section 3.7.3.2).

Land Use Around Launch Facilities. Land uses around the launch facilities are characterized by dry-farmed cropland or rangeland. Only about five launch facilities are adjacent to irrigated lands. Forested land is present at only eight of the launch facilities. The population is sparse with only 46 launch facilities having any occupied structures within the 2,000-foot study area.

Table 3.4.3-6

Land Uses Within the Transporter/Erector Route Corridors

Land Use	Percent
Dry-farmed cropland	53
Rangeland	32
Irrigated cropland	9
Built-up	3
Woodland	2
Water	<1
Mineral extraction	<1
TOTAL:	100

Inhabited Structures Within a 2,000-Foot Study Area. To cover the range of expansion of explosive safety zones of each launch facility, the areas within 2,000 feet of existing Minuteman silo closures were analyzed for the presence of inhabited structures. These areas account for the Small ICBM safety zone requirements plus the locational and structural type uncertainty of the HML shelters.

An analysis of the 2,000-foot study area of the 200 launch facilities revealed the presence of 93 residences, 11 commercial structures, and 1 school in the vicinity of 46 launch facilities. A detailed listing of inhabited structures is presented in Table 3.4.3-7, and Figure 3.4.3-3 shows a generalized location of the launch facilities that contain inhabited structures within the 2,000-foot study area.

The largest number of residential structures occurs in Cascade County (34) followed by Fergus (27), Judith Basin (16), Teton (7), Pondera (6), and Choteau, Toole, and Wheatland (1 each). Launch facility A-6, located in Cascade County, has the largest concentration of residential structures in the ROI (17). Of the 11 commercial structures, 8 are located in Fergus, 2 in Judith Basin, and 1 in Pondera County. One school with 9 students and one teacher is located close to launch facility J-6 in Chouteau County.

Table 3.4.3-7

Number of Inhabited Structures Within the 2,000-Foot Study Areas Surrounding Launch Facilities

Launch Facility[1]	School Structures[2]	Commercial Structures	Residential Structures	Residential Population[3]
A-4	0	0	2	5
A-6	0	0	17	46
A-7	0	0	2	5
A-8	0	0	3	8
A-11	0	0	1	3
B-3	0	0	1	3
B-8	0	0	1	3
B-10	0	0	4	11
C-2	0	0	2	5
C-5	0	0	1	3
C-8	0	0	1	3
C-11	0	2	5	14
D-6	0	0	1	3
D-7	0	0	1	3
D-8	0	0	1	3
D-9	0	0	1	3
D-11	0	0	2	5
E-3	0	0	2	5
E-9	0	0	1	3
G-5	0	0	1	3
H-4	0	0	5	14
H-5	0	0	1	3
H-6	0	0	1	3
H-9	0	0	1	3
I-10	0	0	3	8
J-6	1	0	1	3
J-10	0	0	4	11
K-5	0	0	1	3
M-2	0	0	4	11
M-5	0	2	4	11
M-7[4]	0	3	3	8
N-2	0	0	1	3
N-3	0	0	2	5
N-8	0	0	1	3
N-9	0	3	1	3
O-7	0	0	1	3
P-6	0	0	1	3
P-9	0	0	1	3
Q-15	0	0	1	3
Q-16	0	0	1	3
Q-18	0	0	1	3
S-33	0	0	1	3
S-34	0	0	1	3
T-42	0	0	1	3
T-43	0	1	0	
T-44	0	0	1	3
TOTAL:	1	11	93	259

Notes: [1]Launch facilities that contain no inhabited structures within an explosive safety zone are not listed.
[2]Actual number of school population: 9 students and 1 teacher.
[3]Estimated person per residential structure using ROI average number of 2.7 per household and rounding off to nearest person.
[4]One of the three commercial structures at M-7 contains multiple uses which include a 4-unit motel, barber shop, and a self-service laundry-shower facility and is counted as one structure. The public scale is not counted as an occupied structure.

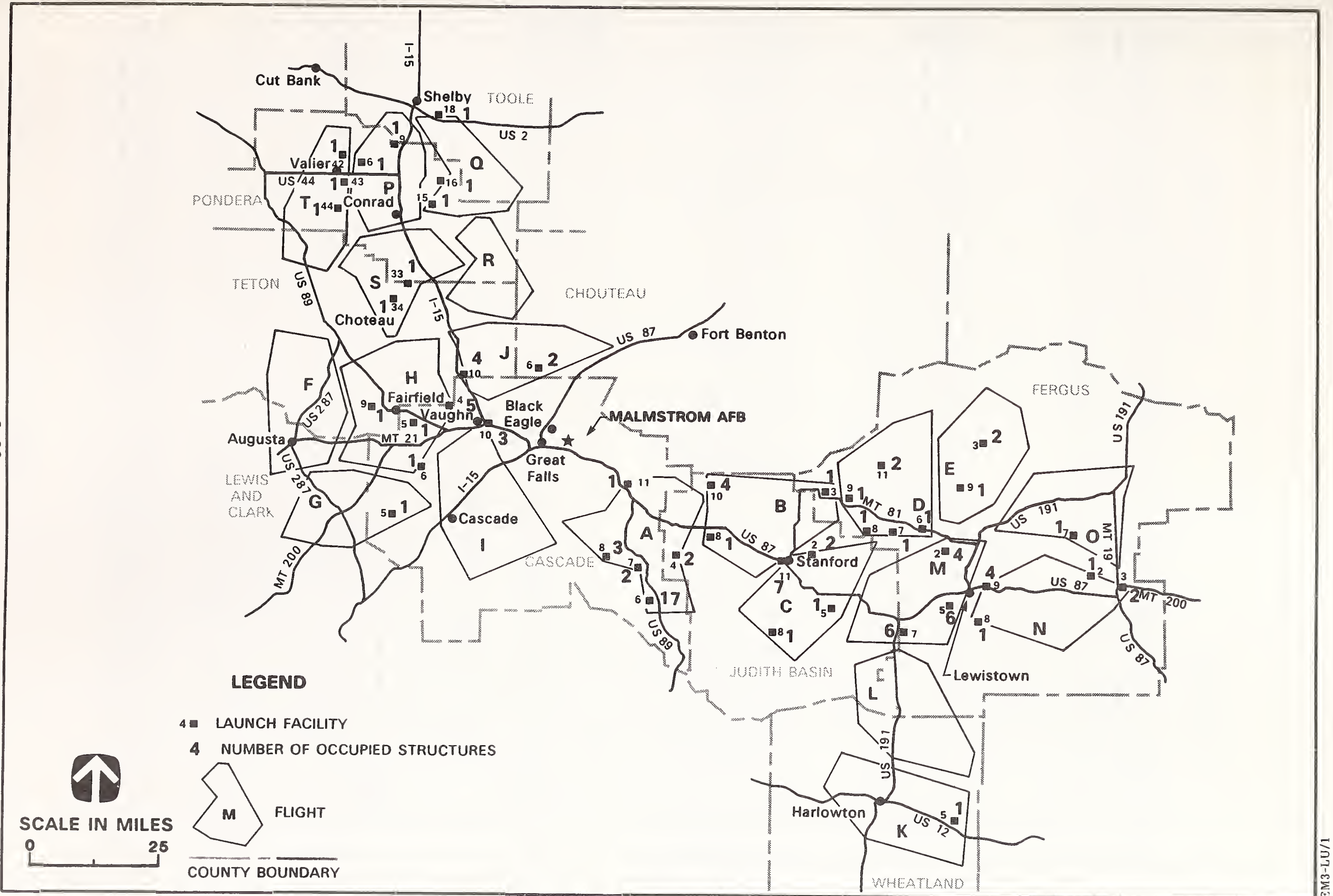


FIGURE 3.4.3-3 LAUNCH FACILITIES WITH OCCUPIED STRUCTURES WITHIN A 2,000-FOOT STUDY AREA

3.5 Recreation

Deployment of the Small Intercontinental Ballistic Missile (ICBM) would result in population increases in communities in or near the deployment area. Depending on the availability of recreation resources and facilities and their current use, population increases associated with the proposed program may result in an increased demand that is greater than the available supply. For purposes of analysis, recreation has been divided into regional and local recreation.

3.5.1 Resource Description

In the Small ICBM Legislative Environmental Impact Statement (LEIS), the recreation analysis was performed at the regional level and primarily focused on developed campground facilities. For this Environmental Impact Statement (EIS), the recreation analysis considers other regional recreation activities and facilities in addition to developed campground facilities, and local recreation facilities and programs.

3.5.1.1 Regional Recreation

Regional recreation is defined as outdoor recreation activities that are dependent upon or enhanced by natural surroundings or resources (e.g., lakes, rivers, and forests). This type of recreation, also known as resource-based recreation, is generally associated with federal, state, and other public lands that may or may not have developed facilities. In general, people interested in regional recreation activities are willing to travel long distances to areas offering such opportunities.

3.5.1.2 Local Recreation

Local recreation is defined as recreation activities that are directly linked to developed facilities and/or parklands. This type of recreation, also known as user-based recreation, is generally associated with municipal or county government lands developed specifically for recreation. Local recreation generally occurs in or near urbanized areas and usually involves relatively short travel distances.

3.5.2 General Analysis Methodology

3.5.2.1 Region of Influence

The Region of Influence (ROI) for the regional recreation analysis includes federal, state, and regionally managed recreation areas located within an approximate 150-mile travel distance from Great Falls, Montana, the community projected to receive the greatest influx of population as a result of the proposed program. The 150-mile distance represents a reasonable upper limit that a majority of the people living in Great Falls can be expected to travel for the purpose of participating in outdoor recreation during a 1 to 3-day period. Some exceptions to this distance were made for those areas where topographic constraints or regional recreational characteristics make such exceptions appropriate. The ROI for regional recreation is the same as that used in the LEIS.

The ROI for the local recreation analysis includes those urban areas projected to receive a majority of the program-induced inmigration, specifically the Great Falls, Lewistown, and Conrad City-County planning areas. A local recreation analysis was not performed in the LEIS.

3.5.2.2 Regional Recreation

The regional recreation analysis included an evaluation of the availability of recreation opportunities in the region, the potential increase in participation in outdoor recreation activities resulting from baseline population growth, and the ability of recreation areas to absorb this increased use. The determination of existing and projected baseline conditions for the analysis involved the identification of resource-based recreation areas within an approximate 150-mile travel distance from Great Falls. Recreation areas were identified and their locations determined using various literature sources, maps, and agency contacts. Information pertaining to available recreation opportunities and facilities and visitation data were then collected for each recreation area from federal, state, and regional park and recreation agencies, including the U.S. Forest Service, National Park Service, Bureau of Land Management (BLM), U.S. Fish and Wildlife Service, and the Montana Department of Fish, Wildlife and Parks. The quality and availability of these data varied by jurisdictional agency as well as by individual recreation area. For the analysis, recreation opportunities and use were considered for various activities, including camping, picnicking, swimming, fishing, hunting, boating, backpacking, horseback riding, off-road vehicle (ORV) use, skiing (both cross-country and downhill), and snowmobiling.

Existing and projected recreation use (in activity days) within the ROI was calculated using participation rates determined for the existing population for each activity in a 1985 outdoor recreation needs survey conducted by the Montana Department of Fish, Wildlife and Parks. Participation values derived for the department's Administrative Region 4 were used because the geographical boundary of this region corresponds approximately to that of the ROI. Projected use was based on the expected increase in population within the ROI, because there is a direct relationship between population levels and increased recreation use.

3.5.2.3 Local Recreation

The local recreation analysis included an evaluation of the supply of parkland and recreation facilities, staffing levels, and the availability of recreation programs in the potentially affected communities. The determination of existing and projected baseline conditions for the analysis involved the inventory and evaluation of recreation facilities and programs provided by the communities projected to receive the majority of program-induced inmigration. Information was gathered from three primary sources: public documents, agency contacts, and field surveys. Park and recreation master plans and inventories, local recreation information brochures, and comprehensive plans for the affected cities and counties were used in the analysis. Primary agency contacts were made with local park and recreation departments/boards and land use planning officials. Field surveys were conducted to supplement and update data from local agencies and available documents.

For the local recreation analysis, established population-based recreation standards were applied to the existing and projected population for the city-county planning areas for two categories: parkland and recreation facilities. The analysis considered existing conditions in terms of available supply and the need for additional improvements based on locally identified deficiencies/surpluses and comparison to established standards. Recreation programs were evaluated to the extent necessary to determine how the demand for specific facilities may be affected by the size and scope of the programs offered and the demand for them. Staffing levels were examined to determine the staffing necessary to

administer, operate, and maintain the park and recreation system. Facilities and recreation programs on Malmstrom Air Force Base (AFB) and commercial/private recreation facilities in the communities were also considered in the analysis.

3.5.3 Existing and Future Baseline Conditions

3.5.3.1 Regional Recreation

A wide variety of recreational opportunities exist within the ROI. These opportunities occur in portions of three national forests (Lewis and Clark, Lolo, and Helena), Giant Springs State Park, numerous state recreation areas and fishing access sites, the Upper Missouri National Wild and Scenic River, Glacier National Park, and several national wildlife refuges and state wildlife management areas. These areas are primarily associated with various physiographic features including the Rocky Mountain Front Range, the Little Belt Mountains, the Missouri River, three large lakes on the Missouri River (Canyon Ferry, Hauser, and Holter), and various other water bodies and mountain ranges in north-central Montana (Figure 3.5.3-1).

Lewis and Clark National Forest, which consists of five separate land units, is the most heavily used recreation area in the ROI. The national forest, particularly along the Rocky Mountain Front and in the Little Belt Mountains, provides a majority of the opportunities in the ROI for camping, fishing, hunting, hiking/backpacking, horseback riding, ORV use, and winter activities. The national forest has two developed downhill skiing facilities and also provides numerous trails for cross-country skiing and snowmobiling. The portions of the Lolo (Seeley Lake area) and Helena national forests within the ROI provide similar recreation opportunities.

Giant Springs State Park, managed by the Montana Department of Fish, Wildlife and Parks, is the most heavily used state park or recreation area in the ROI. The park, located just outside Great Falls along the Missouri River, is a day-use facility and includes a large picnic area and a fish hatchery. Other heavily used areas include state recreation areas on Holter, Hauser, and Canyon Ferry lakes. The BLM also manages a recreation area on Holter Lake. These areas provide camping, fishing, swimming, boating, waterskiing, and other water-based recreation opportunities.

Fishing is the major recreation activity in the region. The Missouri, Smith, Sun, Blackfoot, Marias, and Teton rivers and several small reservoirs and lakes throughout the ROI provide fishing and some boating opportunities. The state maintains fishing access sites on most of these water bodies with the heaviest use occurring at Willow Creek Reservoir, Piskun Reservoir, Eureka Reservoir, and Bynum Reservoir. Floating is a popular activity on the Missouri, Smith, and Blackfoot rivers.

Hunting is also a major recreation activity in the region and primarily occurs on national forest lands, state lands, and scattered parcels of BLM land. Popular waterfowl hunting areas include Freezeout Lake Wildlife Management Area, Benton Lake National Wildlife Refuge, Lake Helena, and Canyon Ferry Lake. Big game hunting primarily occurs on national forest and state wildlife management area lands. Use of these lands for hunting is increasing as more private landowners are restricting hunting opportunities on their lands. Recreation participation within the ROI for various activities is presented in Table 3.5.3-1.

Other important recreation areas bordering the ROI include Flathead Lake, Flathead National Forest (including Hungry Horse Reservoir), and Fort Peck Dam and Lake. These areas were not included in the analysis.

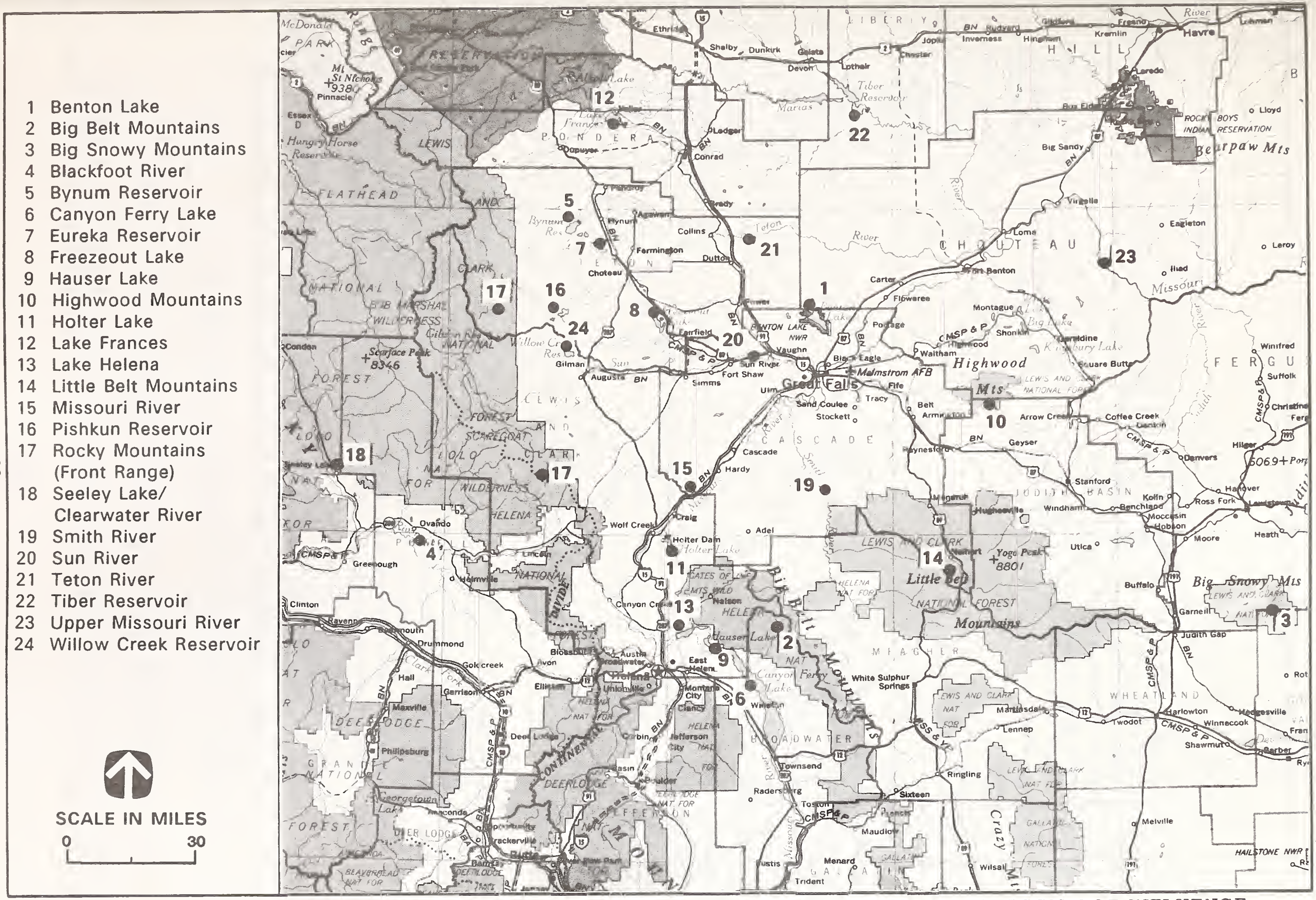


FIGURE 3.5.3-1 PHYSIOGRAPHIC FEATURES ASSOCIATED WITH REGIONAL RECREATION IN THE REGION OF INFLUENCE

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Table 3.5.3-1

Estimated Recreation Participation in the Region of Influence (in Activity Days[1])

Activity	Percent Participation[2]	Median Days[3]	Total Participation[4]
Camping	54.5	8	575,500
Hunting	36.8	10	485,800
Backpacking	12.3	6	97,400
Horseback Riding	20.6	6	163,200
Offroad Vehicle Use (4x4)	19.0	7	175,600
Offroad Vehicle Use (All-Terrain Vehicles)	11.9	10	157,100
Picnicking	77.1	6	610,600
Fishing	57.3	12	907,600
Motorboating	33.6	5	221,800
Waterskiing	16.2	4	85,500
Swimming[5]	43.1	7	398,200
Rafting	14.6	3	57,800
Canoeing	11.4	4	60,200
Snowmobiling	19.0	5	125,400
Cross-Country Skiing	12.3	7	113,700
Downhill Skiing	17.8	6	141,000

Notes: [1]Based on participation rates for Montana Department of Fish, Wildlife and Parks Administrative Region 4 (Cascade, Chouteau, Fergus, Glacier, Judith Basin, Lewis and Clark, Liberty, Meagher, Petroleum, Pondera, Teton, and Toole counties) from the Montana Outdoor Recreation Needs Survey (University of Montana, School of Forestry 1986).
[2]Percent of population 18 years or older estimated to participate in activity at least once during the year.
[3]Median number of days participation in activity occurs.
[4]Total annual participation in activity days based on an estimated 1986 population (18 years or older) of approximately 132,000 for Region 4.
[5]Swimming in lakes, streams, rivers, or ponds.

3.5.3.2 Local Recreation

City of Great Falls. The City of Great Falls Park and Recreation Department is the major provider of parkland and recreation facilities in the Great Falls urban area. In addition, the Great Falls Publics Schools system provides additional facilities which supplement the city's facilities; however, these are not regularly available to the public. Malmstrom AFB also provides facilities for military personnel and Department of Defense civilian employees. Commercial/private facilities (e.g., golf courses, bowling centers, and racquet clubs) are also available in the Great Falls urban area.

The service area of the Great Falls Park and Recreation Department is primarily within the city's boundaries, though in actual practice it extends into the Great Falls City-County Planning Area. This area has a population of approximately 11,000 over the city population. City and noncity residents are charged the same fees for department activities and programs.

The Great Falls Park and Recreation Department operates and maintains 43 developed parks containing approximately 750 acres, including a softball complex, a 9-hole golf course, and an 18-hole golf course. An additional 9-hole golf course may be developed by 1990. In addition, the department has 18 undeveloped parkland parcels containing approximately 380 acres, including 2 islands located in the Missouri River and a 240-acre parcel. Several small parcels are planned for development over the next several years.

The developed parks provide 24 ballfields (3 baseball, 13 youth baseball, and 8 softball), 32 tennis courts, 8 soccer fields, 3 outdoor swimming pools, and an indoor swimming pool. Thirty-two parks have playground apparatus, three parks have jogging paths/parcourses, and ten parks have basketball courts. Cross-country skiing is also available on the 9-hole golf course and one park has a waterfowl pond which can be used as an ice skating rink. The Great Falls Public Schools system provides additional indoor and outdoor facilities, including an indoor swimming pool, an indoor running track, two tennis courts, basketball courts, gymnasiums, and football/soccer fields. Other indoor public facilities available include three racquetball/handball courts and an ice skating/hockey arena.

The Park and Recreation Department is staffed by 14 full-time employees. The number of part-time personnel varies by season, with approximately 65 employees during the summer and 35 during the remainder of the year. The department has a year-round recreation program which includes adult softball, basketball, and volleyball leagues; supervised playgrounds; road races; adult swimming; and adult and youth tennis, golf, and swimming instruction. The department's program is supplemented by various youth leagues (e.g., flag football, baseball, and soccer) and school district athletic programs.

Based on discussions with the Park and Recreation Department director and comparisons with established recreation standards, Great Falls currently has adequate parkland acreage and recreation facilities to serve the existing population, but softball and golf-facility shortages could develop over the next several years. The existing softball fields (i.e., fields used for city league play) and golf courses (even with the addition of 9 holes by 1990) are currently used at or near capacity and demand for these facilities is increasing.

City of Lewistown. The City of Lewistown operates and maintains eight parks, a softball complex, and the Lewistown Civic Center. The parks, totaling approximately 35 acres, provide a swimming pool, an ice skating rink, six tennis courts, four basketball courts, five ballfields (1 baseball and 4 youth baseball), and playground equipment at five of the

parks. One park is available for hiking and nature study. The softball complex has four ballfields and the Lewistown Civic Center has a gymnasium and indoor archery and small-bore rifle ranges.

Lewistown Public Schools system supplements the city's facilities with an athletic field and gymnasium at Fergus High School and playground equipment and basketball courts at three elementary schools. Private recreation facilities available include two bowling alleys, a racquetball club (2 courts), and a country club with a swimming pool and 18-hole golf course. Lewistown has adequate parkland and recreation facilities to accommodate its existing and projected population.

The city has a full-time recreation director and two assistants, and hires a swimming pool manager and lifeguards during the summer months. The City of Lewistown Public Works Department is responsible for maintenance of the park facilities. The City recreation program offers several activities including adult basketball and volleyball leagues. The Lewistown Softball Association offers adult softball leagues and the Lewistown Youth Association provides leagues for various activities including flag football, baseball, basketball, and soccer.

City of Conrad. The City of Conrad operates and maintains approximately 31 acres of developed parkland, which includes five parks and the Conrad Sports Complex. These areas provide a swimming pool, one basketball court, and eight ballfields (1 baseball, 3 softball, and 4 youth baseball). Playground apparatus is available at five of the locations. The city also has a 1.7-acre undeveloped parcel and leases a portion of a church recreation area for an ice skating rink.

The city has a cooperative agreement with Conrad Public Schools system for use of school district facilities, including eight tennis courts, two athletic fields, outdoor basketball courts and playground areas, and two gymnasiums. In addition to these facilities, commercial recreation facilities available include a bowling alley, a racquetball/health club (2 courts), and a 9-hole golf course. Conrad has adequate parkland and recreation facilities to accommodate its existing and projected population.

Conrad's recreation program is directed by a volunteer eight-person recreation committee. The program is primarily directed toward youth activities, but does provide for some adult activities. Maintenance of parkland and facilities is the responsibility of the Conrad Public Works Department. The city hires a recreation director and assistant, a swimming pool director, and several lifeguards during the summer months.

3.6 Visual Resources

Small Intercontinental Ballistic Missile (ICBM) facilities or program-induced land disturbance could influence visual resources, and therefore, the environmental character of the region. For this reason, an analysis of visual resources is included in this Environmental Impact Statement (EIS).

3.6.1 Resource Description

Visual resources are defined as the physical characteristics or qualities of the environment that can be seen by observers of the landscape. A landscape is defined as any area with visual character, irrespective of its aesthetic value. Landscapes that possess a greater degree of visual variety are generally more appealing than those that tend to be monotonous (Bureau of Land Management [BLM 1986]). Each type of landscape is determined by the features that are seen and their arrangement in the landscape composition. These landscape features consist of landform, vegetation, and structures. Each of these features is defined by four basic elements: form, line, color, and texture. All of these elements are present in every landscape, but each exerts a different degree of visual influence within a landscape. The more elements that exert a strong visual influence or contrast in a given landscape, the stronger or more interesting the landscape character. The degree of variety and harmony among the basic elements determines whether or not a given landscape is pleasant to view. The Small ICBM Legislative Environmental Impact Statement (LEIS) contained a regional analysis of visual resources and presented a comparison of several deployment modes and locations; this EIS provides a site-specific analysis of the visual resources at individual facility locations.

3.6.2 General Analysis Methodology

The visual resources study involved an analysis of the extent that the Small ICBM program would change the visual landscape at Minuteman launch facilities in north-central Montana and at Malmstrom Air Force Base (AFB).

3.6.2.1 Region of Influence

The Region of Influence (ROI) for visual resources covers the entire deployment area, which includes all launch facilities, and Malmstrom AFB. However, a smaller area of intensive study was identified and includes only those launch facilities that are located within 0.5 mile of, and are visible from, scenic and heavily traveled highways (highways with a 1985 annual average daily traffic [AADT] of at least 1,000). (In some instances, launch facilities within 0.5 mile of such highways cannot be seen from the highways because of intervening topography.) Twenty-one launch facilities (out of the total of 200) and their surrounding landscapes are included in this area. The proposed Hard Mobile Launcher (HML) shelters to be constructed at launch facilities that are more than 0.5 mile from the highways are not likely to be exposed to a large enough number of viewers to have an effect on visual resources. In addition, the ROI includes those areas in the vicinity of any new program facilities (e.g., technical and personnel facilities) at Malmstrom AFB that could be seen from U.S. 87/89.

For the regional analysis conducted for the LEIS, the ROIs extended 5 miles from heavily traveled highways. This was the most appropriate ROI where three deployment modes were being considered and actual construction locations were unknown in two of the three basing modes. Because the specific program locations are known for Small ICBM deployment at Malmstrom AFB, a much smaller area of intensive study has been used.

3.6.2.2 Baseline Methodology

Because the analysis methodology of program impacts on visual resources, as used here, is a modified version of the BLM Visual Resources Management (VRM) methodology, it requires landscape descriptions. Instead of identifying VRM classes, as is done with the BLM VRM methodology, four generalized landscape types were identified within the deployment area. These types of similar landscape areas are termed landscape characteristic provinces (LCPs) and were derived mainly from landform maps. Using computer graphic methods, a deployment area map showing launch facilities and launch control facilities was compared with an LCP map, and the number of launch facilities in each LCP was plotted. In addition to the deployment area, an investigation of the visual environment at Malmstrom AFB was also performed.

3.6.3 Existing and Future Baseline Conditions

3.6.3.1 Landscape Characteristic Provinces

The deployment area is located within the northwestern portion of the Great Plains Physiographic Province. Like most of the Great Plains, the deployment area has flat to rolling terrain naturally vegetated with short grassland, but also includes some mountainous terrain along its southern edge. Although there are numerous streams and creeks, the major river through the deployment area is the Missouri, with the Sun, Teton, Marias, and Judith rivers as its largest tributaries.

Four LCPs were identified within the deployment area: Mountains, Foothills, Rolling Uplands, and Planar Uplands. The visual character within each LCP is similar; that is, within each LCP, landscape features (landform, vegetation, and structures) are similar in form, line, color, and texture. Figure 3.6.3-1 shows the generalized LCP configurations, the launch facilities and principal highways in the deployment area. It is expected that visual resources will remain unchanged in the future, with dryland agriculture and grazing continuing to be the major modifications to the landscape.

Mountains Landscape Characteristic Province. The Mountains LCP is located mainly along the southern edge of the deployment area, and comprises only about 4 percent of the total area; it includes the community of Monarch. This LCP ranges in elevation from 4,000 to 8,000 feet, with slopes generally over 25 percent and relief of over 1,000 feet. It includes portions of the Big Snowy, Little Belt, Moccasin, Highwood, and Judith mountains, and Square Butte. These areas have a rich diversity of line, form, color, and texture in steep-walled canyons and alpine meadows. The slopes are mostly forested with ponderosa pine, Douglas fir, and Rocky Mountain juniper, with seasonal colors ranging from deep greens, browns, and golds, to the white of winter snows. The minimal manmade intrusions on the landscape include fencelines, roads, timber-cutting operations, and a few mining operations in the South Moccasin and Judith mountains.

Foothills Landscape Characteristic Province. The Foothills LCP is located mainly in the southern portion of the deployment area, and comprises about 6 percent of the area; it includes the communities of Heath and Forest Grove, east of Lewistown. The foothills are generally at elevations ranging from 3,500 to 4,500 feet with slopes between 10 and 25 percent and local relief of up to 1,000 feet. The foothills, with their mountain backdrops, provide interesting linear variety and shape contrasts. Vegetation includes fescue grasslands, sagebrush, and trees in riparian areas. Seasonal colors range from green, to gold, to white, to deep browns. Visual intrusions include occasional ranches and

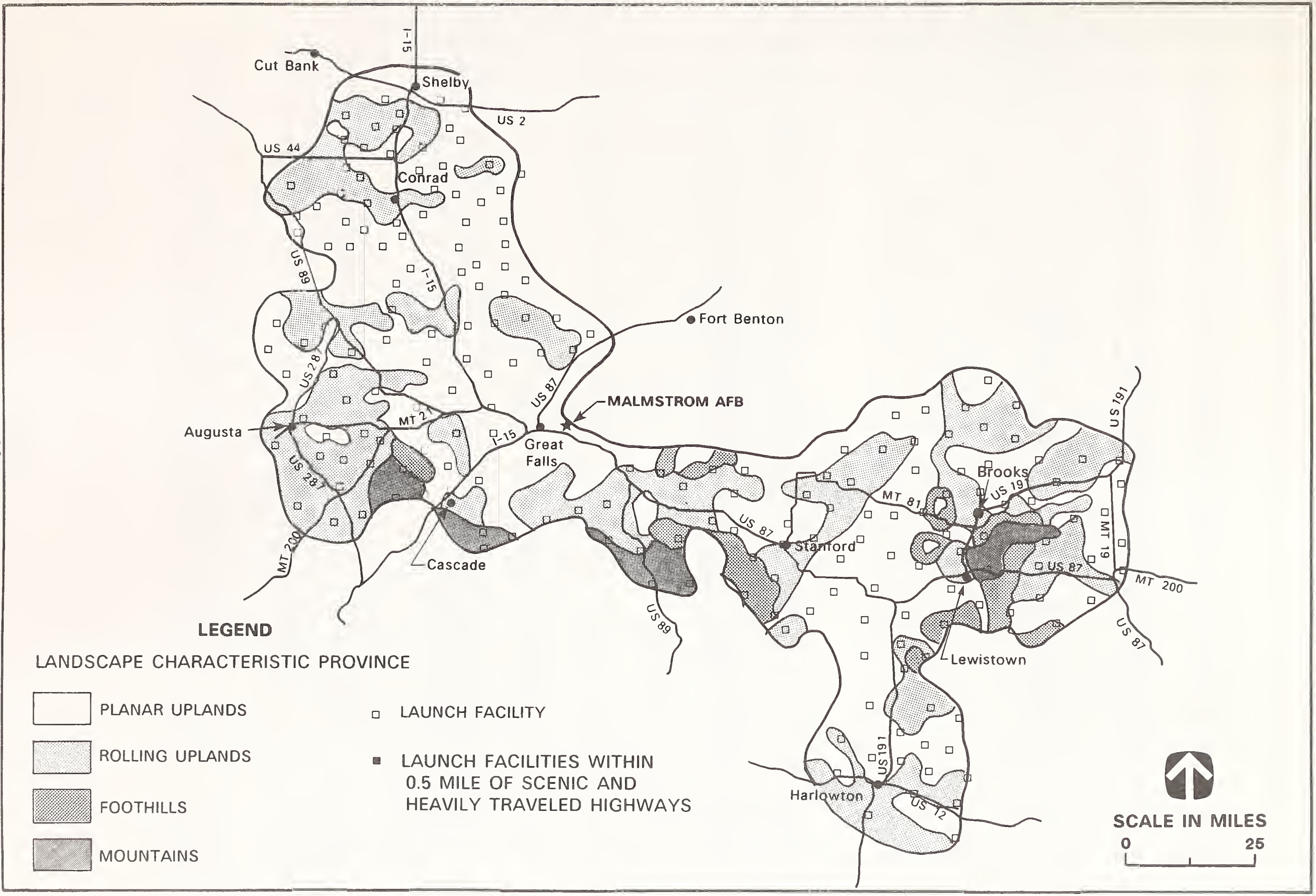

FIGURE 3.6.3-1 DEPLOYMENT AREA LANDSCAPE CHARACTERISTIC PROVINCES, LAUNCH FACILITIES, AND PRINCIPAL HIGHWAYS

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farmsteads, scattered roads, and fencelines. Most of the area is rangeland, but some cultivation occurs.

Rolling Uplands Landscape Characteristic Province. The Rolling Uplands LCP is fairly well distributed across the deployment area, and comprises about 36 percent of the area; it includes the community of Harlowton. There is less diversity in form, line, color, and texture in this LCP. Ranging between the 3,000 and 4,000-foot elevation, the Rolling Uplands LCP reveals land surface slopes of 3 to 10 percent and relief of up to 200 feet. Numerous creeks and streams provide interesting linear contrasts in the area. Vegetation along these creeks includes cottonwood, ash, box elder, and willows, while the natural vegetation of the Northern Great Plains includes fescue grasslands and sagebrush. Colors range from green to brown to white, depending upon the season. Visual intrusions include roads, fencelines, farmsteads, and a few power transmission lines; none appear frequently enough to be visually objectionable. Farms and ranchhouses are considered picturesque in this setting. Much of the land is cultivated, and depending upon the season, fields are either plowed, are planted with wheat, or are covered in stubble.

Planar Uplands Landscape Characteristic Province. The Planar Uplands LCP is also widely distributed across the deployment area, and comprises about 54 percent of the total area; it includes the communities of Lewistown, Stanford, Great Falls, and Shelby. This LCP ranges from 2,500 to 3,500 feet in elevation, with the majority of the area nearly flat to gently rolling. Surface slopes are generally less than 3 percent and relief is less than 100 feet. The topography is divided by steep walls of low-gradient streams lined with riparian vegetation. Predominant natural vegetation is western, bluebunch, and thickspike wheatgrass, as well as green needlegrass. Colors are similar to the Rolling Uplands LCP. Visual diversity is provided by creeks, reservoirs, and lakes scattered throughout the area. Visual intrusions include roads, fencelines, powerlines, farmsteads, and farm-storage structures. Croplands create bold rectilinear patterns which at times distract from the natural landscape.

3.6.3.2 Launch Facilities in Landscape Characteristic Provinces

There are 200 launch facilities in the approximately 8,500-square-mile deployment area. The facilities are fairly well distributed across the area, with an average distance between them of about 6.5 miles. Only 21 of the launch facilities are located within 0.5 mile of, and can be seen from, scenic highways or heavily traveled highways (Figure 3.6.3-1).

Because the 200 launch facilities have no aboveground buildings and the communication/security facilities have a low or "see-through" profile, they do not create a noticeable visual intrusion upon the deployment area landscape. The facilities are most likely to be seen in the Planar Uplands LCP, where the fences and powerpoles are more likely to be silhouetted against the sky of the flat terrain.

Table 3.6.3-1 shows the number of launch facilities located in each LCP for both the deployment area and the area of intensive study. Because the mountains and foothills topography is least conducive to the placement of launch facilities, those two LCPs contain the fewest sites.

Table 3.6.3-1

Launch Facilities
by Landscape Characteristic Province in the Deployment Area
and Area of Intensive Study

Landscape Characteristic Province	Deployment Area		Area of Intensive Study[1]	
	Number	Percent	Number	Percent
Mountains	6	3.0	1	4.8
Foothills	9	4.5	0	0
Rolling Uplands	67	33.5	9	42.9
Planar Uplands	118	59.0	11	52.3

Note: [1]Area of intensive study includes those launch facilities within 0.5 mile of scenic highways and heavily traveled highways (highways with a 1985 AADT of at least 1,000).

3.6.3.3 Visual Environment at Malmstrom Air Force Base

Malmstrom AFB is located on the eastern limits of the City of Great Falls in north-central Montana. The base is situated in the Planar Uplands LCP (at about the 3,500-ft elevation) overlooking the Missouri River. Although U.S. 87/89 passes through the runway clear zone in the southwestern portion of the base, the majority of the cantonment area is located over a mile from the highway. Some housing, however, is found only about 0.5 mile from the highway on the west side of the base. Except for water towers and radar domes, all onbase facilities appear very low on the horizon from that distance. Power and light poles near the southern boundary of the base are the most obvious intrusions on the landscape. The future visual environment at Malmstrom AFB will be changed to a minor extent by the introduction of support facilities for the KC-135R air refueling mission.

3.7 Cultural and Paleontological Resources

Deployment of the Small Intercontinental Ballistic Missile (ICBM) at Malmstrom Air Force Base (AFB) is likely to disturb cultural and paleontological resources. Procedures for the identification, evaluation, and treatment of cultural resources are contained in a series of federal and state laws and regulations in addition to the National Environmental Policy Act. Cultural and paleontological resources include four major elements: prehistoric resources, historic and architectural resources, Native American resources, and paleontological resources.

Prehistoric and historic cultural resources are protected by a variety of laws and their implementing regulations; the most important of these are the National Historic Preservation Act of 1966 and its 1980 amendments, the Archeological and Historic Preservation Act of 1974, and the Archaeological Resources Protection Act of 1979. Sites and areas of religious or heritage significance to Native Americans are addressed by both ARPA and the American Indian Religious Freedom Act of 1978. Treatment of archaeological and Native American resources is further guided by the Advisory Council on Historic Preservation regulations, Protection of Historic Properties (Code of Federal Regulations 1983, 36 CFR 800). Paleontological resources are generally not afforded the same degree of protection, but some federal agencies (e.g., U.S. Forest Service [USFS]) and states, including Montana, have laws and regulations that include the treatment of fossil materials. Some fossil localities qualify for recognition under the National Natural Landmarks Program (Code of Federal Regulations 1979, 36 CFR 62).

3.7.1 Resource Description

The individual resource elements discussed in this analysis are the same as previously considered in the Legislative Environmental Impact Statement (LEIS). However, the data bases required for the present analyses differ qualitatively from those used for the LEIS. The LEIS data were derived mainly from regional overviews. While such studies contain useful resource summaries, they often do not provide the detailed data necessary to evaluate the effects of a specific project. For this Environmental Impact Statement (EIS), previous studies and archival data were used to identify distributional patterns for prehistoric, historic, and paleontological sites. Additionally, Native American groups were consulted directly for specific data on sacred areas and site types.

3.7.1.1 Prehistoric Resources

Prehistoric resources are physical properties resulting from human activities predating written records. They may range in size from an isolated artifact, to a site, to an entire geographic district. The more common site types include short-term camps, quarry/lithic sources, hunting sites, and plant gathering/processing sites. Less common types include complex villages, burial sites, pictograph/petroglyph areas, and ceremonial sites. Sites may contain artifacts (stone tools, ceramics, basketry, and other manufactured implements), features (hearths, tipi rings, and other nonportable facilities), and faunal and floral materials.

3.7.1.2 Historic and Architectural Resources

Historic and architectural resources consist of physical properties, usually related to Euroamerican occupations, that postdate written records. Historic resources include architectural structures and archaeological features such as building foundations and trash pits. The western United States, because of its rapid development from open

frontier to a complex blend of rural and urban society in a period of less than 150 years, manifests a large variety of historical and architectural resources. Among these are mines, trails (e.g., Oregon, Bozeman, and Whoop-Up), railroads, stage stops, ranches, homesites, cemeteries, dumps, forts, and towns.

3.7.1.3 Native American Resources

Native American resources include districts, sites, structures, biota, and objects considered culturally valuable and important to Native Americans for traditional, religious, and other reasons. These resources may be prehistoric sites and artifacts, areas of historic Native American occupation or use, contemporary sacred sites and areas, materials for the production of sacred objects and traditional implements, hunting and gathering areas, and other biological and geological resources of importance to Native Americans.

3.7.1.4 Paleontological Resources

Paleontological resources are the physical remains, impressions, or traces of plants or animals from a former geological age. These include casts, molds, or trace fossils such as impressions, burrows, and tracks. Areas where such remains can be recovered typically include surface exposures, subsurface deposits exposed by ground-disturbing activities, and circumstances affording special environments for preservation such as caves, peat bogs, or tar pits.

3.7.2 General Analysis Methodology

3.7.2.1 Region of Influence

The Region of Influence (ROI) for cultural and paleontological resources is defined by the Malmstrom AFB boundary, the perimeter of the Minuteman facilities deployment area, and associated transporter/erector (T/E) routes. The ROI forms a wide, irregularly shaped area of 8,500 square miles measuring approximately 165 miles east-west by 180 miles north-south in its greatest dimensions. Portions of Cascade, Chouteau, Fergus, Judith Basin, Lewis and Clark, Pondera, Teton, Toole, and Wheatland counties, Montana are in the ROI (Figure 3.7.2-1). The ROI is the same as the area studied in the LEIS.

3.7.2.2 Prehistoric Resources

Baseline conditions for prehistoric resources were estimated by using existing data to construct a predictive model of site distribution. Statistical techniques, such as logistic regression, were used to relate site locations to topographic variables and to project the probabilities of encountering sites in various unstudied landform settings. Regional research questions were identified and prioritized, and site types were evaluated according to their potential for yielding information relevant to high-priority research goals. This rating, along with a consideration of rarity, was used to assign a level of importance to each site type, and the results were incorporated, along with site probabilities, into a sensitivity map of the ROI. Analyses focused on National Register of Historic Places (NRHP)-eligible sites. Local experts were consulted to obtain estimates of the proportion of sites likely to be eligible in specific regions.

A total of 354 sites, previously recorded in or near the study area, were used to generate the model. They occur primarily in areas intensively surveyed by professional archaeologists, and all were assumed to have accurately mapped locations. The sites were

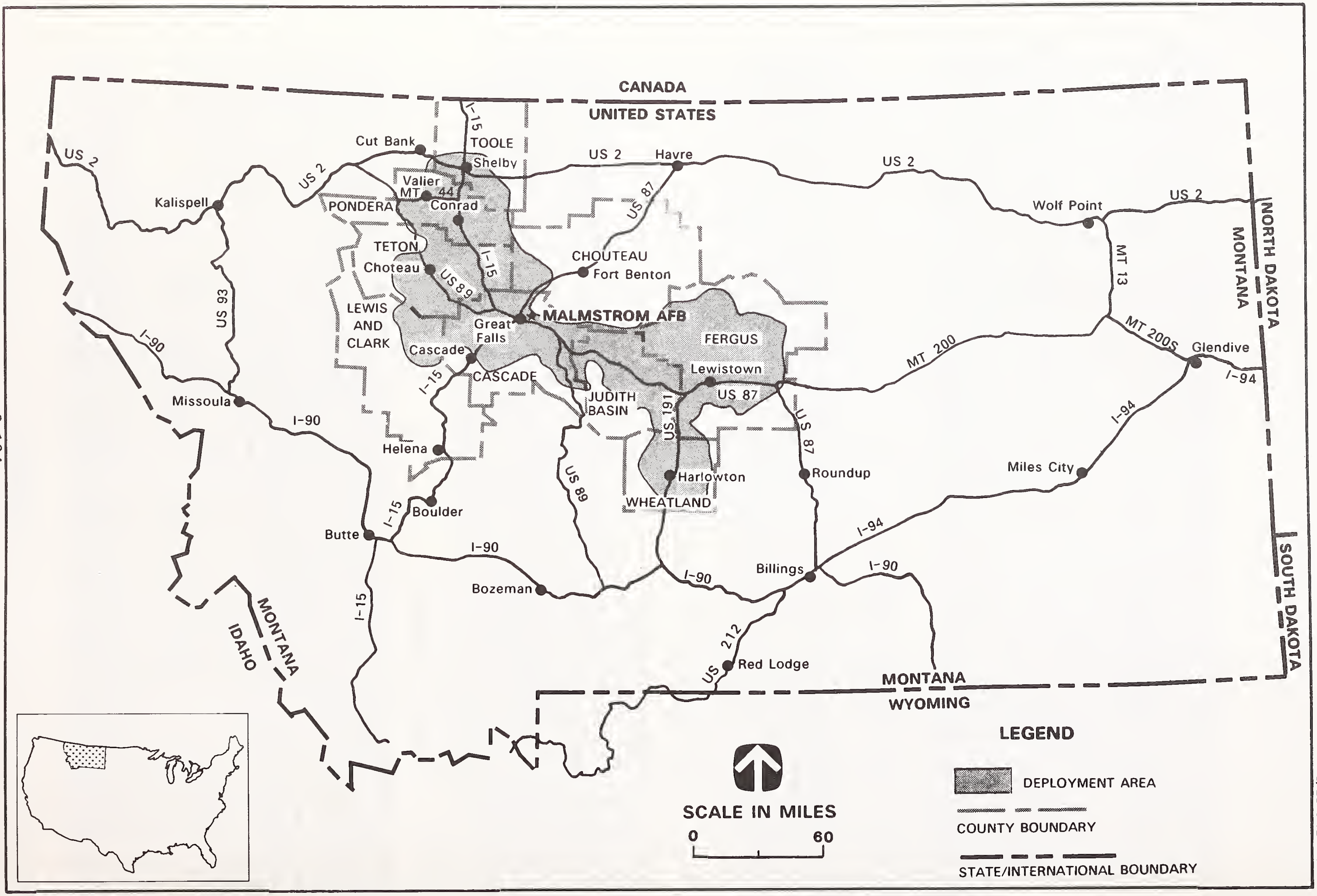

FIGURE 3.7.2-1 REGION OF INFLUENCE FOR CULTURAL AND PALEONTOLOGICAL RESOURCES

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selected from areas that provided, as nearly as possible, a balance between upland and riverine topographic settings. In order to demonstrate that site locations are patterned and do not share the characteristics of points scattered generally across the landscape, sites were compared to an independent control group. The control points ($n = 4{,}022$) are assumed nonsite locations chosen systematically from throughout the study area.

The site and control locations were digitized at 1:100,000-scale and topographic variables were calculated from automated 1:250,000-scale Digital Elevation Model and Triangular Irregular Network data files. The use of independent automated topographic data avoids the need to rely on and integrate environmental information from various previous archaeological investigations. Eight variables were measured (for sites and controls) which had been shown in previous studies to be important predictors of hunter-gatherer sites:

- Horizontal distance to permanent water;
- Horizontal distance to any water;
- Vertical distance to permanent water;
- Vertical distance to any water;
- Aspect;
- Slope;
- Relief; and
- Elevation.

Difference of means comparisons of these variables for sites and controls indicated that site and control point locations differ significantly in horizontal distance to permanent water, relief, horizontal distance to any water, elevation, and vertical distance to permanent water (p F 0.008 for all variables). These five variables were then used in a logistic regression analysis of site and control point locations. Logistic regression was used because it does not assume a normal distribution in the data and because previous studies had indicated better predictive results than for other classification techniques, such as discriminant analysis. Elevation did not add significantly to the regression analysis and the resulting function related site occurrence to four variables:

$$L = 0.494243 - 0.0001201 \times (\text{horizontal distance to permanent water}) - 0.00112131 \times (\text{relief}) - 0.0012322 \times (\text{horizontal distance to any water}) + 0.00376 \times (\text{vertical distance to permanent water})$$

Values for the four topographic variables were calculated in 1-mile grid units throughout the study area and the equation was used to calculate site present versus site not present probabilities for each of the 11,576 squares. The results are mapped in Section 3.7.3, Figure 3.7.3-2. The model does not predict where undiscovered sites are specifically located; instead, locations are mapped that possess environmental characteristics similar to places where sites have been identified.

3.7.2.3 Historic and Architectural Resources

Historic resource distributions were estimated from records of known sites. Records were obtained from a search of the state site files and from a Montana State Highway Department study of historic bridges. Patterns of site distribution were used to identify those areas likely to contain NRHP-eligible resources and to make qualitative judgments about their sensitivity.

3.7.2.4 Native American Resources

Baseline conditions for Native American resources were ascertained by identifying as many sacred and traditional use areas as possible. Data were obtained through interviews with Native American traditional leaders, from previous ethnographic and ethnohistoric studies, and from existing state site records. Sacred and traditional use area distributions were not summarized on maps because of the sensitivity of some resource types.

3.7.2.5 Paleontological Resources

Existing paleontological resource distributions were estimated by identifying known fossil localities and by defining the regional extent and exposure of surface and near-surface geological formations. A literature search was conducted, and professional researchers and knowledgeable local amateurs were contacted for details on the paleontology of each formation. The distribution of fossils in a given formation, along with the relative importance of those fossils, contributed to the assessment of relative sensitivity. Assessments were summarized in a map of sensitivity zones covering the entire ROI.

3.7.3 Existing and Future Baseline Conditions

3.7.3.1 Prehistoric Resources

The archaeological record in the study area spans 12,000 years of prehistory from the Paleoindian period (10,000-5,500 B.C.) to the Protohistoric period (A.D. 1750-1803) (Figure 3.7.3-1). Although the area has been poorly studied, 1,261 prehistoric sites have been recorded. Materials relating to the late Middle Prehistoric cultural manifestation Pelican Lake and the Late Prehistoric period Avonlea constitute important components of the local archaeological record. Paleoindian sites have been identified in other, nearby portions of Montana, and buffalo kill sites are widely recognized as important in the region.

Prehistoric inhabitants in the study area were hunter-gatherers who used a variety of strategies ranging from specialized hunting to broad spectrum gathering depending on the food supply. These groups were highly mobile in response to seasonal changes in the availability of various food sources. Because groups exploited a variety of environmental resources in different zones, prehistoric sites occur in many locations and reflect different types of cultural activity.

Prehistoric site types identified in the area include limited use camps such as plant-processing sites or hunting stands; habitation sites, including stone circle sites and rockshelters; antelope or buffalo kill and butchering sites; rock art sites (petroglyphs or pictographs); quarries and lithic sources; and rock cairns and alignments. Sacred areas may appear archaeologically in the form of medicine wheels, vision-quest sites, eagle-

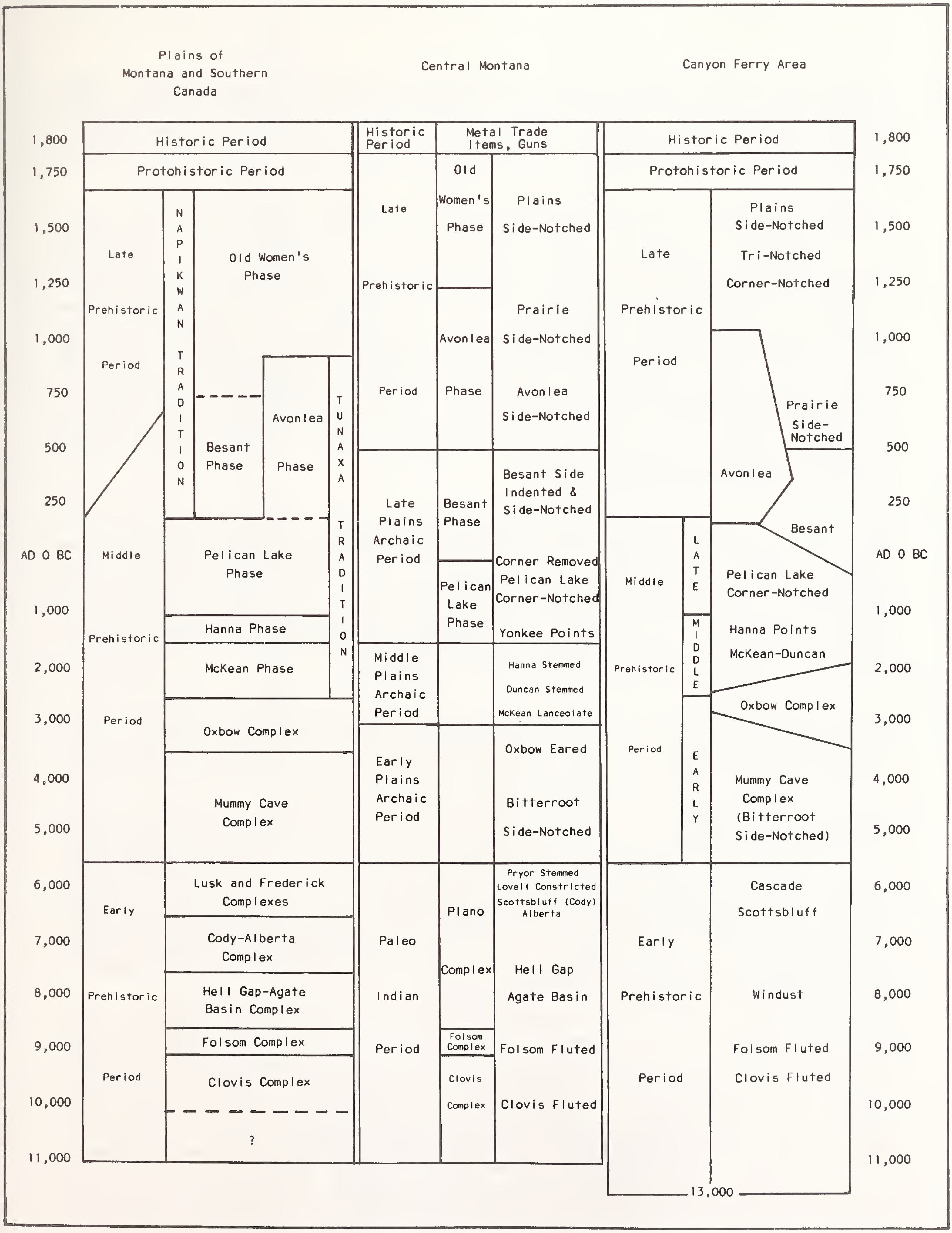

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FIGURE 3.7.3-1 PREHISTORIC CULTURAL CHRONOLOGIES FOR THE MALMSTROM AFB STUDY AREA

catching pits, rock figures, burials, and ritual structures (e.g., sweatlodges). Some archaeological sites may still be used as sacred areas by Native American groups. General trends in site locations suggest that habitation sites occur near the edges of ridges or bluffs. Buffalo kill sites are located in breaks and bluffs along major drainages, and hearth scatters and butchering/processing sites occur along drainage terraces.

Prehistoric site types differ with regard to their research potential (Table 3.7.3-1). Research issues addressed in previous projects include time period studies, settlement and subsistence patterning, social organization, exchange systems, technological patterns, and environmental studies. Buried or stratified sites such as Sun River, Lost Terrace, or Holmes Terrace contain excellent site integrity with minimal disturbance providing good spatial and temporal control for evaluating cultural deposits. The study area has a high potential for yielding additional important buried or stratified sites along the major drainages. Surface sites with little disturbance such as stone circle sites on grazing lands (as opposed to plowed agricultural fields) provide structural information, and site configuration may contribute to an understanding of social organization of prehistoric groups. Even some types of disturbed sites, such as unsystematically excavated buffalo kills, can provide limited information which could contribute to time period and settlement pattern studies.

Sites may also be important when they relate to time periods not well known in the study area. Early Middle Prehistoric sites are very rare in the area and throughout the Northern Plains. Paleoindian materials are also relatively rare, and sites from either period would be important because of their potential to fill gaps in the present data base. The site types with the highest research potential in the study area are buried or stratified campsites or processing sites, undisturbed stone circle sites, and buffalo kill and processing sites. The majority of these site types will occur on the floodplains, terraces, and bluffs of the major river valleys and drainages.

Only three prehistoric sites in the study area, Ulm Pishkun (Ulm Buffalo Jump), 24JT104, and 24TT83, are listed on or considered eligible for the NRHP (Table 3.7.3-2). The vast majority of known prehistoric sites have not been evaluated for the NRHP, and additional potentially eligible sites are expected to occur in the study area.

Archaeological research in the study area has consisted of site documentation by amateurs, reconnaissance along rivers, linear vehicular reconnaissance and pedestrian survey along utility line corridors, inventories on federal lands, and site excavation. Previous cultural resources investigations at Malmstrom AFB were limited to surface surveys of 15 acres at the present location of the power plant and 80 acres in scattered parcels for the Hard Mobile Launcher (HML) vehicle operations training area on the southeastern portion of the base. No cultural or paleontological resources were recorded, and the baseline conditions on the base remain unknown. For this reason, the base and deployment area are considered together.

Previous projects have involved approximately 1 percent coverage of the study area, confined primarily to river valleys. Environmental zones that are likely to contain prehistoric sites are not equally represented in the current data base, and actual baseline conditions are not well defined. It is not possible to provide a credible assessment of program impacts without considering those resources likely to occur in unstudied areas. Although the Montana study area is poorly known archaeologically, the most serious shortcoming of the existing data base is the lack of balanced survey coverage provided by previous studies. About 95 percent of the study area is in upland terrain, but previous research has been concentrated mainly along river valleys. As a result, the areas most likely to be affected by the program are those within which archaeological sensitivity is least well known.

Table 3.7.3-1

Scientific Information Potential of Prehistoric Sites

Site Types	Potential Research Applications						
	Time Period Studies	Land Use Patterns	Subsistence Patterns	Social Organization	Exchange Systems	Technological Patterns	Environmental Studies
Limited Use Camps		X	X			X	X
Habitations							
Complex Camp	X	X	X	X	X	X	X
Stone Circle	X	X	X	X	X	X	X
Rockshelter	X	X	X	X	X	X	X
Kill/Butchering	X	X	X	X		X	X
Sacred Areas							
Medicine Wheel		X		X			
Burial	X	X		X	X	X	
Vision Quest		X					
Eagle Catching Pit		X					
Rock Figure		X		X			
Other (Ritual Lodges)		X		X			
Petroglyphs/ Pictographs		X			X	X	
Lithic Sources	X	X	X		X	X	X
Rock Cairns		X					
Rock Alignments		X	X				
Hearth/Roasting Pit	X	X	X				X

Table 3.7.3-2

National Register of Historic Places Sites in the Study Area, by County

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Formally Determined Eligible

Cascade County

Great Falls and Vicinity
- Central High School (now called Paris Gibson Square)
- Charles M. Russell House and Studio[1]
- Great Falls Portage[1]
- Mullan Road
- Margaret Block, 413-415 Central Avenue
- Building at 108 Central Avenue
- Cascade County Courthouse
- Timothy Edwards Collins Mansion
- Liberty Theater Building

St. Peters Mission Church and Cemetery, Cascade vicinity
Ulm Pishkun (Ulm Buffalo Jump), Ulm
J.C. Adam's Stone Barn, Sun River vicinity
Robert Vaughn Homestead (Captain Couch Ranch), Vaughn vicinity

Chouteau County
Judith Landing Historic District, Winifred vicinity

Fergus County

Lewistown
- St. James Episcopal Church and Parish House
- St. Joseph's Hospital
- Masonic Temple
- Culver Studio
- Fergus County Improvement Corporation Dormitory
- Carnegie Library
- St. Leo's Catholic Church
- Fergus County High School
- Huntoon Residence
- Lewistown Central Business Historic District
- Lewistown Courthouse Historic District
- Lewistown Silk Stocking District

Judith Basin County
Prehistoric Site 24JT104

Pondera County
Conrad City Hall, Conrad

Wheatland County
Graves Hotel, Harlowton
McQuitty Building, Harlowton

Table 3.7.3-2 Continued, Page 2 of 2

Determined Eligible by Consensus[2]

Cascade County

Great Falls and Vicinity
- Great Falls Historic District
- 109 Jefferson
- Truly Stage Stop/Hotel
- Great Falls Post Office
- 10th Street Bridge
- CM STP and P Overpass

Fergus County

Lewistown
- Jawbone Railroad Depot
- Berry Seed Co. Warehouse
- Reedsport Post Office

Judith River Bridge
Sample's Crossing Building

Lewis and Clark County

Dearborn River Bridge

Teton County

24TT118 (timber stringer bridge)
24TT83 (tipi ring site)
Burgmaier Homestead
Cordova Grain Elevator
Dinkes Farmstead
Bremmer Farmstead
Alzheimer Farmstead
H. Schwert Homestead

Notes: [1]National Historic Landmark.
[2]State Historic Preservation Officer and federal agency have determined site eligible (see Code of Federal Regulations, 36 CFR 800.4(c)).

All launch facilities are candidates for facility siting; therefore, specific impact areas (i.e., launch facilities and road segments) have not yet been identified. Because it was necessary to consider potential impacts throughout the study area, a predictive model was used to program baseline conditions.

The various techniques of predictive modeling are important tools in cultural resource management. The locational correlates of known resources are used to project the probability of the occurrence of sites in areas not yet studied. Theoretically, the results permit the planner to predict the numbers, types, and sizes of sites likely to be affected in various topographic settings. However, the condition of the existing data base imposes limitations on the level of detail which can be expected in the results. Existing records from the north-central Montana region vary greatly in the precision of their data on site type, site size, time period, and even location. Therefore, it was necessary to limit the present analysis to a consideration of the simple occurrence or nonoccurrence of prehistoric sites.

Results of the model express the relative likelihood of encountering sites in an area that is not yet studied. Site probabilities, or predicted relative densities, are represented as different shades on a sensitivity map (Figure 3.7.3-2). High sensitivity areas (Zone 4) occur along drainages and elsewhere when moderate relief and a short distance to water co-occur. On the basis of previous surveys in such areas, site densities are estimated at five per square mile. The site types expected to occur in this zone are those with the highest research potential, including stratified campsites, large stone circle sites, and bison kill and processing sites (Table 3.7.3-1). Low sensitivity (Zone 1) is predicted in areas lacking either water or moderate relief (e.g., areas of low relief or steep slopes). Site densities of one or less per square mile are estimated, and site types are typically limited to small stone circle sites and lithic scatters. Intermediate probabilities were identified for transitional slope areas such as foothills.

The model was tested by classifying the input data as if site/control identity were unknown; 72 percent of sites and 55 percent of nonsites were correctly classified. These results are in line with previous applications of the technique in spite of the larger study area and coarser-grained data and grid units used in the present study. The model also accords well with the results of recent investigations on the Suffield Military Reserve in southern Alberta. The primary indicators of site locations in both cases are distance to water and relief, even though the variables were measured differently in the two studies. Additionally, the generally low site occurrence on glacial plains, contrasted with high density in hummocky moraine areas, is indicated in both studies (Figure 3.7.3-2, areas east and southeast of Conrad).

The model was also tested against the results of two reconnaissance surveys in the deployment area. Because of the large size of the study area, these surveys constitute only partial tests of the model. Approximately 12 percent of T/E routes were surveyed to note the presence or absence of archaeological materials in or adjacent to existing easements. Both the number of sites identified and their locations generally fit the model predictions. The proposed housing expansion and HML vehicle operations training areas adjacent to Malmstrom AFB were also surveyed. Two sites were identified near ephemeral drainages east of the base; determinations of NRHP-eligibility have not been made. None were found in the housing expansion area, even though it was predicted likely to contain sites. Although these results are likely to be further tested and refined by future researchers, the sensitivity zones in Figure 3.7.3-2 provide the basis for assessing program impacts (Chapter 4.0).

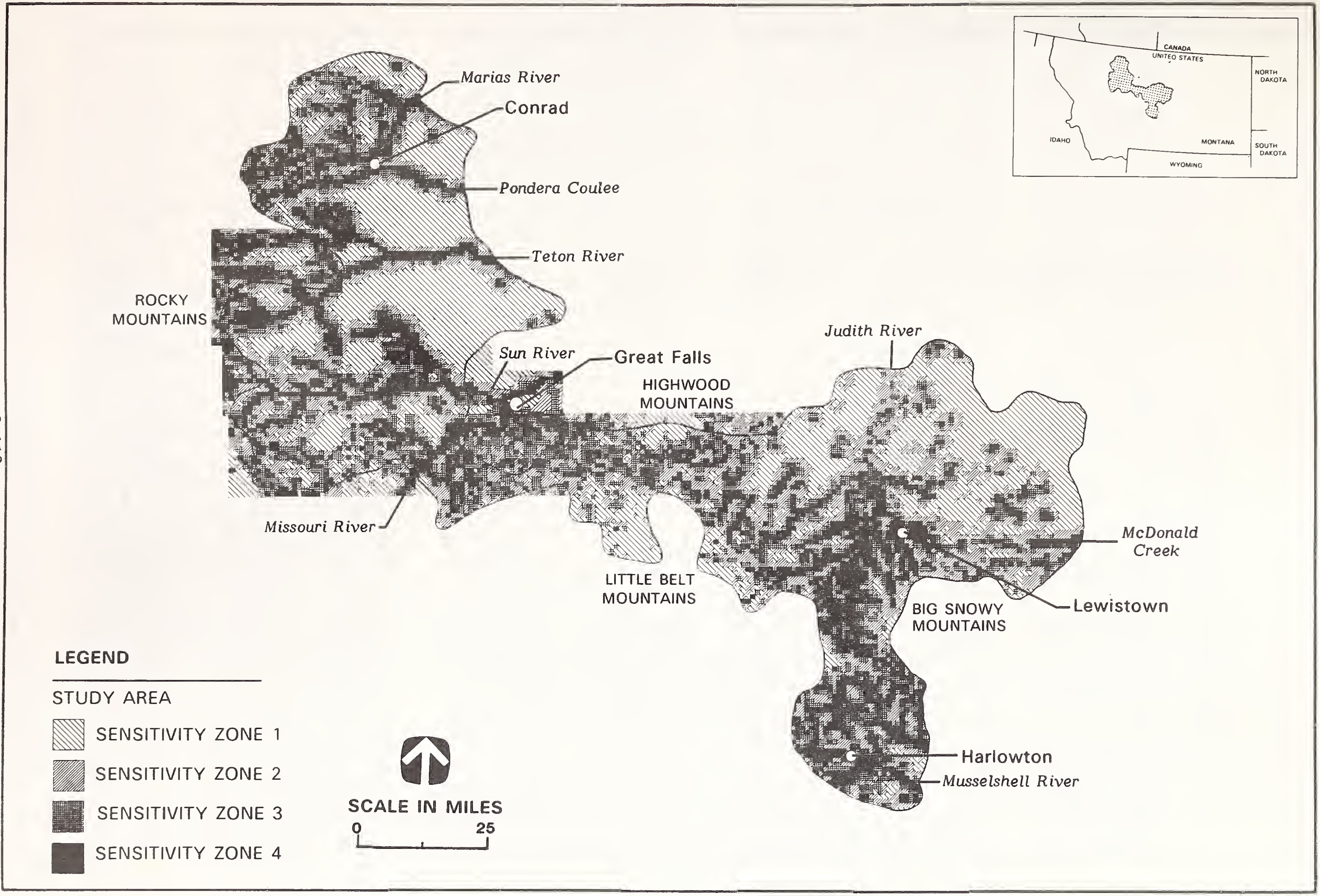

FIGURE 3.7.3-2 PROJECTED PREHISTORIC SITE SENSITIVITY IN THE STUDY AREA, NORTH-CENTRAL MONTANA

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3.7.3.2 Historic and Architectural Resources

The historic period in Montana began approximately A.D. 1800 when the Lewis and Clark Expedition, following the Missouri River, passed through on its way to the Pacific Ocean. Recorded cultural sites in the counties encompassing the study area number approximately 1,900. About 640 of these sites are historic and relate to the wide variety of historic activities that have occurred since 1800. Historic bridges comprise approximately 150 of the sites, and an additional 150 buildings or other types of structures may be found in urban historic districts that have been listed in the NRHP.

The remaining sites represent the early fur trade; the mining boom; the missionization efforts of the Jesuits; military activities, particularly during the late nineteenth century Indian wars; the transportation industry; and ranching and farming activities. Historic cultural resources recorded in the study area consist of mines and their associated structures; homesteads, ranches, sheep camps, line shacks, and corrals associated with agriculture; sawmills and camps associated with the timber industry; military posts; residences and public buildings in towns and cities; trails, roads, railroad construction camps, and railroad grades associated with exploration and transportation; bridges (highway and railroad); and fur-trading posts. Approximately 24 individual historic sites and 4 historic districts in the study area are listed in the NRHP (Table 3.7.3-2). An additional 19 sites and 1 historic district have been determined eligible by consensus of the State Historic Preservation Officer (SHPO) and a federal agency (Table 3.7.3-2). Others not yet identified probably occur within the study area.

Table 3.7.3-3 summarizes expected site types and their likely research potential. Close examination of this table reveals similarities in the importance of site types pertaining to different historical activities. This is because the patterns of development often affected interrelated segments of society that produce distinctive types. For example, mining activities hastened the development of both the transportation industry and agriculture in the lower valleys. The long history of military exploration and occupation affected settlement patterns of agriculturists, the locations of trading posts, and the development of transportation routes. Early Montanans often influenced several aspects of the state's development. These persons, the events in their lives, and the physical structures which remain as evidence of their activities, are parts of Montana's history. When this history is more fully documented, the result is likely to be new listings of significant sites, buildings, or historic districts which are eligible for inclusion in the NRHP.

On Malmstrom AFB, some buildings potentially eligible for inclusion in the NRHP may be affected by the proposed program. None have yet been determined eligible, but 16 properties are old enough to be considered under an existing Department of Defense (DOD) Programmatic Memorandum of Agreement (PMOA) (Table 3.7.3-4). The PMOA establishes guidelines for the treatment of temporary World War II buildings in the context of the DOD program for the demolition of such structures. Twelve of these structures have been rated as candidates or scheduled for demolition. It will be necessary to evaluate these structures in consultation with the SHPO, according to the stipulations of the PMOA (Appendix B.1).

Historic highway and railroad bridges are of concern to Montana State officials. The Montana State Highway Department conducted a statewide bridge survey from 1979 to 1981, and more than 500 bridges were listed. Within the nine counties of the study area, 90 bridges were recorded to Historic American Engineering Record standards, and 14 of them are considered significant for engineering properties. None of the bridges

Table 3.7.3-3

Scientific Information Potential of Historic Sites

Site Types	Potential Research Applications						
	Time Period Studies	Historic Group Studies	Land Use Patterns	Subsistence Patterns	Social Organization	Exchange Systems	Technological Patterns
Trails, Roads	X						
Fur-Trading Posts	X	X			X	X	
Religious Sites	X	X	X	X	X		X
Military Sites	X	X	X		X	X	X
Mining Industry	X	X		X		X	X
Transportation Industry	X	X	X	X		X	X
Ranch and Farmsites	X	X	X	X	X	X	X

Table 3.7.3-4

Potential National Register-Eligible Buildings on Malmstrom AFB

Building No.	Description	Condition Code[1]	Year Built
100	Flagpole base	1	1942
140	Headquarters, FAC	3	1944
200	Base Engineer Maintenance Shop	2	1943
205	Headquarters, SAC	3	1943
210	Base Engineer Maintenance Shop	3	1943
280	Vehicle Operations, heating and parking	3	1943
439	Base Engineering Storage Shed	3	1942
440	Exchange retail warehouse	3	1942
464	Base Engineering Covered Storage	3	1943
529	Administrative Office, non-Air Force	3	1943
677	Post Office	3	1942
1308	AFOSI Office - Security Police Operations	3	1942
1441	Headquarters Center	2	1943
1443	Multiple Use, storage, and shops	3	1943
1445	Hangar Maintenance	2	1943
1502	Water Tank	4	1942

Notes: [1]Condition Code:
1-Fine
2-OK, needs repair
3,4-Candidate or scheduled for demolition

recorded in that study were evaluated for historic significance under NRHP criteria. Some of the bridges recorded several years ago have been replaced or repaired and their ratings may need to be reexamined. Bridges built after 1930 were not recorded because they were not 50 years old at the time of the study. Small ICBM road construction will extend through 1994; therefore, those bridges built before 1944 must be considered.

Analysis of state bridge inventories revealed 152 bridges in the study area old enough to qualify for the NRHP. Twenty are categorized as bridges scheduled for improvement because of program requirements; they are either too narrow or structurally unsound for HML use. They require upgrading or replacement and must, therefore, be evaluated for NRHP eligibility. Six of these bridges have either been repaired or upgraded since construction, which implies that their integrity has been damaged; they may no longer be considered eligible.

Of the remaining 14 bridges, 8 are of timber stringer construction, 5 are tee beam, and 1 is a steel girder and floor beam. One timber stringer bridge (24TT118, state bridge No. P00009043+03091) has been determined eligible for the NRHP (Table 3.7.3-2 and 3.7.3-5). This bridge, built in 1936, crosses the Floweree Canal northeast of Augusta on U.S. 287. It is unique in the state because of its length and number of spans. Most timber stringer bridges are single spans approximately 25 feet long. This bridge has three spans (43 ft center span and end spans of 25 ft) and may be the longest of the standard Montana highway construction designs.

Table 3.7.3-5

Potential National Register-Eligible Bridges That May Be Affected in the Montana Study Area

Bridge No.	Hwy	County[1]	Feature Crossed	Type[2]	Date	Status[3]
L07561003+02001	CR561	CA	Shaw Canal, west of Simms	TBM	1934	2
P00060082+03731	U.S. 87	CA	Southeast of Great Falls	TBM	1941	2
U05205000+04681	U.S. 89	CA	Burlington Northern	TBM	1934	2
P00057082+02191	U.S. 87	FG	Mill Ditch	TBM	1922	2
P00057103+08521	U.S. 87	FG	Drainage north of Grassrange	TS	1939	3
P00061067+01311	U.S. 191	FG	Box Elder Creek	TS	1940[4]	3
P00081034+00551	MT 81	FG	Canal near Hilger	TS	1934	3
P00057034+09231	U.S. 87	JB	Wolf Creek west of Stanford	TS	1937	2
P00057042+02741	U.S. 87	JB	Drainage, Windham	TS	1935[4]	3
P00057043+01841	U.S. 87	JB	Sage Creek, Windham	TS	1935[4]	3
P00057044+02931	U.S. 87	JB	Drainage, Windham	TS	1935[4]	3
P00057045+07231	U.S. 87	JB	Dry Creek, Windham	TS	1935[4]	3
P00057046+00001	U.S. 87	JB	Stockpass Drainage	TS	1935	3
P00057048+08001	U.S. 87	JB	Stockpass Drainage	TS	1935	3
P00009037+02001	U.S. 287	LC	Hogan Slough	TS	1931	3
P00009038+01621	U.S. 287	LC	Elk Creek	TS	1931	3
P00009043+01451	U.S. 287	LC	North Fork Sun River, Northeast of Augusta	SGFB	1936	2
P00021002+06271	BR-115	PD	Canal South of Conrad	TBM	1931	3
L50068010+06001	CR 068	TT	Spring Coulee	TS	1930[4]	3
P00009043+03091	U.S. 287	TT	Floweree Canal, Northeast of Augusta	TS	1936	1

Notes: [1]County: CA = Cascade; FG = Fergus; JB = Judith Basin; LC = Lewis and Clark; PD = Pondera; TT = Teton.
[2]Type: TBM = tee beam; TS = timber stringer; SGFB = steel girder floor beam.
[3]Status: 1 = Determined eligible for NRHP.
2 = Highest potential for eligibility.
3 = Old enough to qualify for NRHP.
[4]Bridge has been repaired or refurbished.

The probability of NRHP eligibility for the other timber stringer bridges is remote. They are simple structures having timber or treated pole supports and a single railing. Approximately 1,000 similar structures exist throughout the state, most of which follow a simple design developed in 1914. Discussions with the Montana SHPO indicate that such a bridge would be eligible only if it were in "pristine" condition. Therefore, the only other potentially eligible bridges in the study area are the tee beam and steel girder floor bridges scheduled for improvement (Table 3.7.3-5).

Another possible area of concern is Square Butte, located just west of Great Falls. Square Butte is a massive natural landmark, made famous by and closely identified with Montana's most famous artist, Charles M. Russell. Because of the cultural significance of this landmark for local residents and people interested in western art, it may be eligible for inclusion in the NRHP and for listing as a National Natural Landmark. Square Butte may also have religious or ceremonial significance for Native American groups who once lived or traveled in this area (Section 3.7.3.3).

A number of old mining and farming towns, some of which are now ghost towns, are within the study area, on or near T/E routes, and may be eligible for inclusion in the NRHP. Some of these are Moccasin, Hobson, and Giltedge on U.S. 87; Monarch on U.S. 89; Barker and Hughesville; and areas north of Lewistown, Maiden, Hilger, Kendall, Christina, and Moulton.

The Robert Vaughn Homestead, 2 miles from Vaughn in Cascade County, has been determined eligible for the NRHP, and the Judith Landing Historic District has been listed. The district comprises 15 square miles of historic structures, prehistoric and historic archaeological sites, burial grounds, and other evidence spanning a long period of human occupation. The district is located near the mouth of the Judith River, just outside the study area.

Several Hutterian colonies are located within the study area. Some of these are Milford, Cascade, New Rockport, Spring Creek, and Deerfield. Hutterites originally settled in South Dakota in the 1870s, and gradually moved into adjacent states and Canada. They are communal agriculturists and have been described as the largest family-type communal group in the western world.

3.7.3.3 Native American Resources

Native American groups known to have used the study area include the Shoshone, Bannocks, Salish, Northern Paiute, Kootenai, Blackfeet (Piegan and Blood), Flathead, Nez Perce, Crow, Gros Ventre (Atsina), Chippewa-Cree, Assiniboine, Sioux, Arapaho, and Cheyenne. The northwestern boundary of the study area is near the Blackfeet Indian Reservation.

Archaeological evidence indicates the presence of Protohistoric period populations in the study area before A.D. 1600. These people were hunters and depended on buffalo to supply their food, clothing, shelter, and weapons. Buffalo were hunted communally, through the use of jumps. Sites associated with these Protohistoric hunters are virtually identical to prehistoric sites, can be identified only by dating, and are represented by tipi rings, buffalo jumps, short-term camps, and quarries. Not until the early 1700s when horses were acquired did the nature of sites change and evidence of continuity between the Protohistoric Indians and more recent occupants emerge.

The Protohistoric groups appeared from the south and west and may have been direct ancestors of contemporary tribes. Indians living in the southern and eastern Plains were pushed westward toward the Rockies by eastern groups who were themselves forced west by Euroamerican expansion. The Kootenai have been identified as the earliest resident Indians, but by about A.D. 1700, Shoshone from the south and Blackfeet from the northeast forced the Flathead westward, where they joined the Pend d'Oreille, became friendly with the Kootenai, and formed hunting partnerships with the Nez Perce. While most of these people settled west of the Continental Divide, they continued to hunt in the Plains. By the early nineteenth century, the Piegan Blackfeet controlled north-central Montana east of the Rocky Mountains. The Crow eventually settled southeast of the study area but continued to hunt as far west as Blackfeet territory. The last Indian groups to enter Montana were bands of Chippewa, Cree, and Metis who moved south from Canada in the late nineteenth century. The Metis are predominately Cree, with Assiniboine, Chippewa, and French or other European blood. Members of the Little Shell Band of Metis settled in north-central Montana, and some of them live in Great Falls, while others settled on the Rocky Boy Reservation, outside of the study area. The historic and modern distribution of Indian groups in Montana is summarized in Figure 3.7.3-3.

Various writers have identified Montana's Indians during the 1800s as nomadic Plains people who were extremely spiritual. Their religion pervaded all aspects of their lives and was intimately interwoven with all features of nature. Spiritual values were ascribed to some types of vegetation, animals, rock formations, high prominences, and water sources such as springs. Identification of these places of sacred significance can be made only by consultation with appropriate tribal representatives of those groups known to have used the area.

While none of the study area includes Indian reservation lands, it is possible that sacred, religious, ceremonial, or traditional-use areas outside the reservations may be affected by the proposed program. Concerns regarding such areas may be expressed by contemporary Indian residents in the vicinity and by other groups who are known to have used the area at some time since A.D. 1500. Tribes known to have used or lived in the study area have been notified of the proposed program and invited into a consultation process. Most of the study area is within Blackfeet territory as recognized in Lame Bull's Treaty of 1855 (Figure 3.7.3-3); therefore, most concerns regarding the present study area have been voiced by the Blackfeet. Respondents have indicated that there will be a high level of concern about discovery of burials during construction and have expressed a desire to provide Indian monitors. There have also been general statements about past occupation or use of large areas which are not now part of the reservation but which, in the past, were used in a sacred, ceremonial, or traditional manner. These areas are still held to be sacred in tribal mythology and oral history, but some uncertainty is apparent about how such areas should be treated with regard to current usage.

Potential sacred or ceremonial areas include vision-quest sites, rock art, Sun Dance grounds, large tipi rings (diameters greater than 10 meters), medicine wheels, cairns, eagle-catching pits, and burials. Forty of these types of sites have been recorded in the state site files from the nine-county study area. The most common identifiable site types are vision-quest structures and medicine wheels. Of the 40 sites, only 9 occur in or adjacent to the deployment area. The most sensitive sites are burial grounds and four are known to occur in the study area: on Arrow Creek in Fergus County, on Deep Creek and near Priest Butte in Teton County, and at St. Peter's Mission Cemetery near Cascade. The Blackfeet and Kootenai are likely to have sacred areas within the program area; however, they have not been identified. One major sacred area has been located at

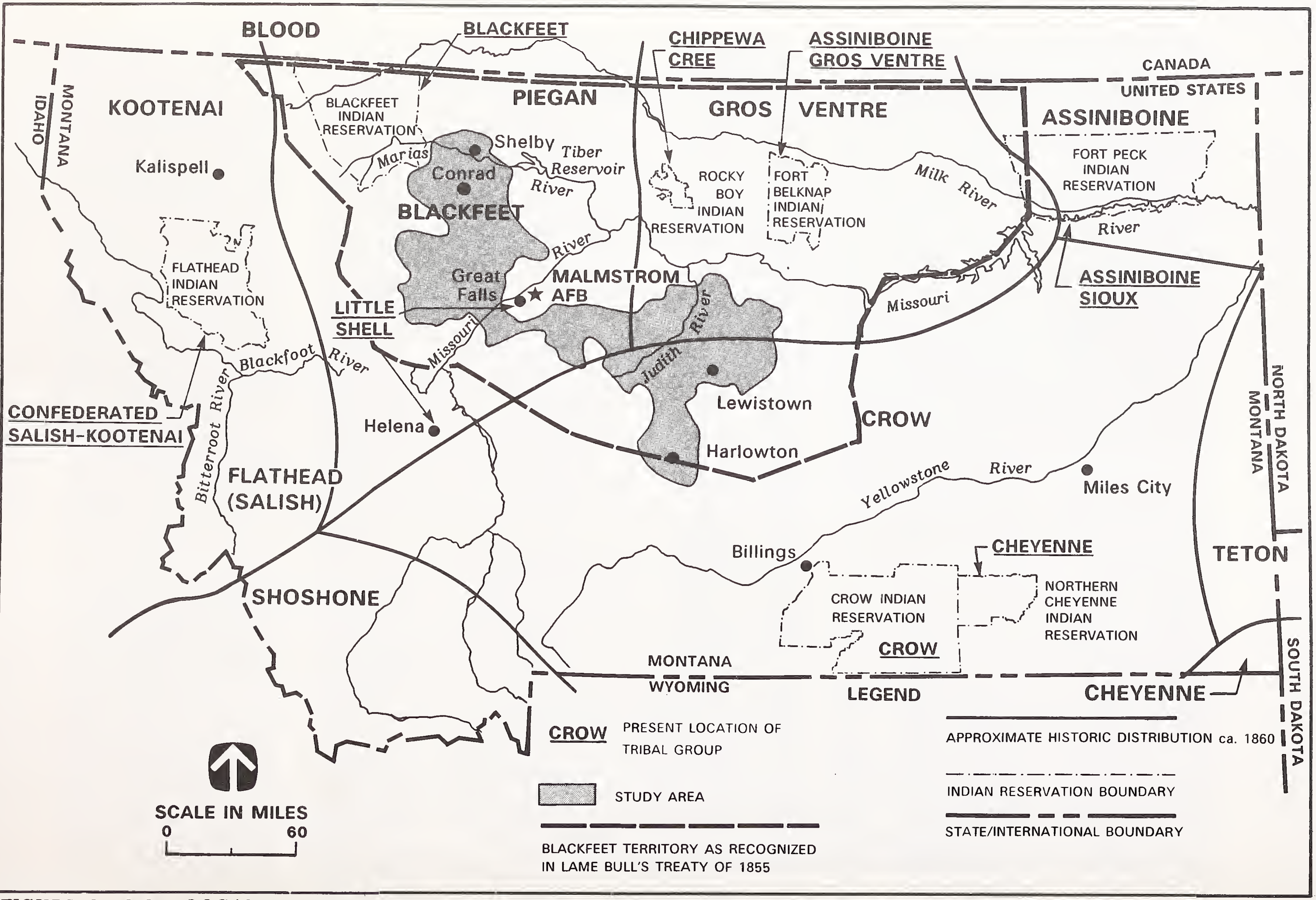


FIGURE 3.7.3-3 LOCATION OF NATIVE AMERICAN GROUPS IN MONTANA

EM3-CR/2

the confluence of the Sun and Missouri rivers, and possible vision-quest sites have been reported south of the Sun River on Square Butte. Existing records probably provide a minimal estimate of Native American resources, and additional areas of concern may be identified as a result of the consultation process.

3.7.3.4 Paleontological Resources

Some of the best preserved and most unique fossil localities in North America occur in the Malmstrom AFB study area. The fossils range in age from Cambrian to Quaternary. Fossils may occur in almost all geological units in the study area, but the most important are the Cretaceous Two Medicine and Judith River formations, important for dinosaurs, reptiles, and early mammals; and the Bear Gulch Limestone of Mississippian age, famous for excellent preservation of diverse vertebrate and invertebrate marine faunas. The fossil-rich Paleocene Hell Creek beds are outside the study area to the southeast and east. Vertebrate fossils may also be found occasionally in the Quaternary terrace gravels scattered across the study area.

Fossils are important research tools in documenting the evolution of organisms, interpreting paleoecological environments, and dating the stratigraphy where they occur. Fossil assemblages containing vertebrate remains, or associated vertebrate and invertebrate remains, are among the most important. Invertebrate fossils are usually of marine origin and, therefore, abundant, widespread, and well preserved. Vertebrate fossils are of continental origin, localized, and rarely preserved which make them more important and rare when encountered. Other conditions that contribute to the importance of a deposit include a diversity of species, excellent preservation or depositional integrity, or the presence of rare species. Both the Bear Gulch Limestone and the Two Medicine Formation in Montana meet these special circumstances. The significance of these fossil areas is reflected in the amount of national and international publicity they receive and by the great amount of professional investigation currently being conducted.

Few legal mandates protect fossils. They are not protected by legislation on either private or Department of the Interior lands in the United States. However, the Montana Environmental Policy Act and Montana Antiquities Act protect paleontological finds on State lands in Montana, and USFS regulations (Code of Federal Regulations 1986, 36 CFR 261) protect vertebrate and unique fossils on USFS-administered lands. Additionally, some fossil localities may qualify for recognition under the National Natural Landmarks Program (Code of Federal Regulations 1979, 36 CFR 62).

The areal distributions of bedrock geologic units in the study area are shown in Figure 3.7.3-4 and summarized in Table 3.7.3-6. These surface or near-surface bedrock units generally occur within 10 feet of the surface or less. Mississippian limestones (Madison and Big Snowy groups) are exposed in many of the mountain ranges of north-central Montana. The most important Mississippian unit in this area is the Bear Gulch Limestone. It is a member of the Heath Formation which, in turn, is the uppermost formation of the Big Snowy Group. The only known surface outcrop of this important fossiliferous unit occurs east of Lewistown, comprising only 0.1 percent of the study area. The Bear Gulch Limestone is important because it contains vertebrate and invertebrate faunal assemblages characterized by excellent preservation. The deposit is considered the third most rich and diverse fossil-bearing formation in the world after the Jurassic Solnhofen Limestone in Bavaria and the Burgess Shale in Canada.

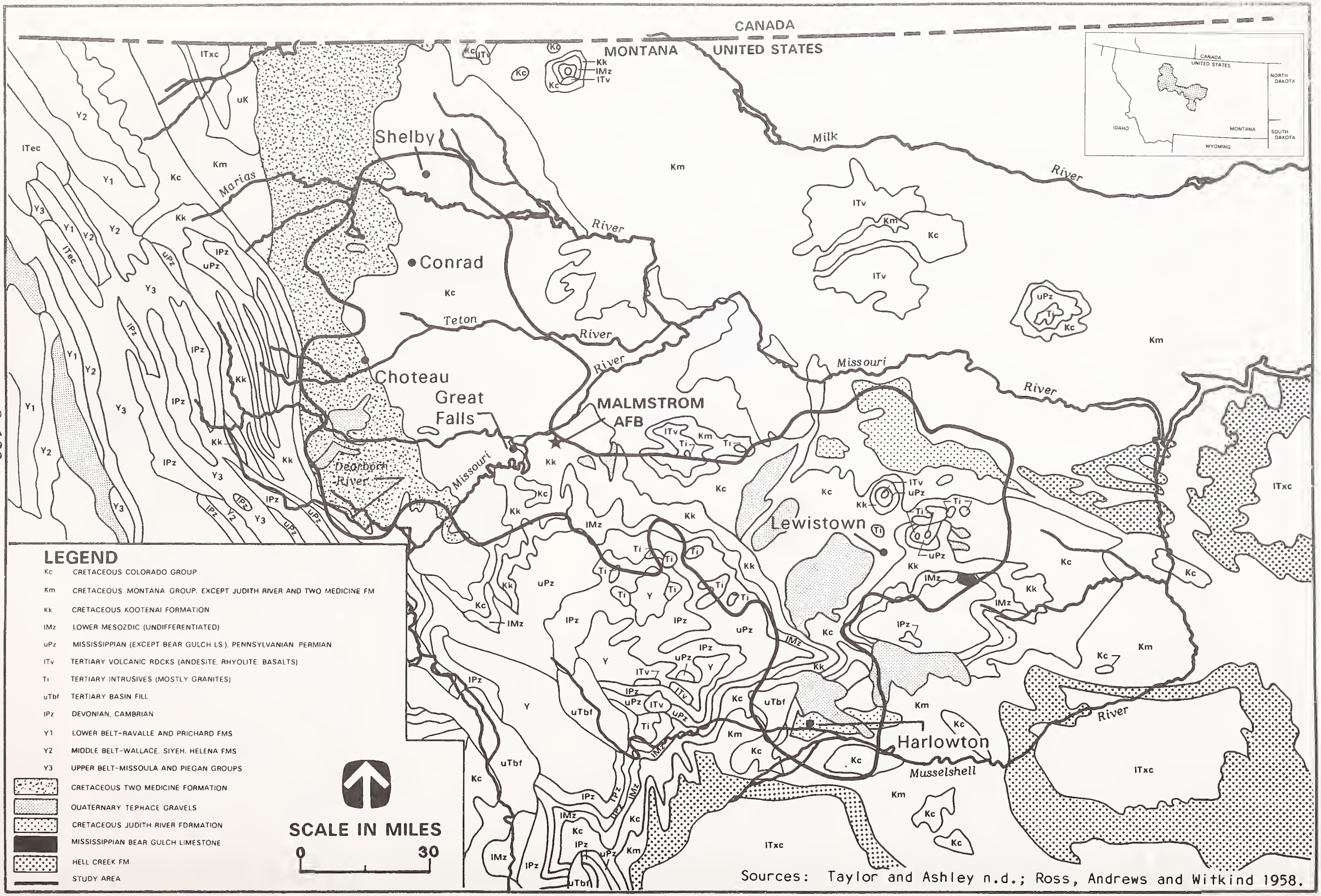


FIGURE 3.7.3-4 GEOLOGIC MAP OF NORTH-CENTRAL MONTANA

Table 3.7.3-6

Surface Geological Formations in the Deployment Area

Formation or Group	Percentage
Quaternary terrace gravels	7.0
Tertiary volcanic rocks (andesite, rhyolite, basalts)	1.6
Tertiary intrusives (mostly granites)	0.9
Tertiary basin fill	0.5
Cretaceous Colorado Group	46.0
Cretaceous Montana Group, except Judith River and Two Medicine Fms.	14.0
Cretaceous Two Medicine Formation	11.5
Cretaceous Judith River Formation	6.0
Cretaceous Kootenai Formation	6.0
Lower Mesozoic (undifferentiated)	3.0
Mississippian (except Bear Gulch Ls.), Pennsylvanian, Permian	3.0
Mississippian Bear Gulch Limestone	0.1
Devonian, Cambrian	0.4
	100.0

The Morrison Formation of Jurassic age, famous for dinosaur fossils in other parts of North America, is not as rich as the Judith River or Two Medicine formations in Montana. It may actually be devoid of dinosaur fossils in some portions of the study area.

The most extensive, significant, fossil-bearing deposits in the study area are the Two Medicine and Judith River formations, covering 11.5 and 6 percent of the surface, respectively. The Two Medicine Formation crops out on the extreme western end of the study area. Hadrosaur and Hypsilophodont nests, eggs, and baby dinosaurs were found in this unit. The discovery of intact dinosaur nests has been duplicated in only one other area of the world, a 1923 discovery in the Gobi Desert. The nests in Montana also contained young dinosaurs and evidence of adults caring for the newly hatched young. Some articulated fossils may be found wherever the Two Medicine Formation occurs but the Willow Creek Anticline west of Choteau is the most productive area yet identified. The Cretaceous Judith River Formation, found in the eastern portion of the study area, is as fossiliferous as the Two Medicine Formation to the west and the Hell Creek beds to the east, but the dinosaur fossils are generally disarticulated.

Quaternary terrace gravels occur throughout the study area over a total of 7 percent of the surface. These gravels occasionally contain important vertebrate fossils. Fossils appear to be more numerous in the gravels outside the study area to the north and east.

The Cretaceous Colorado Group, which, in the study area, is mainly shale of the Niobrara, Mowry, and Thermopolis formations, comprises 46 percent of the exposed bedrock geologic units in the study area. It does not contain significant fossil-bearing formations in the region. Based on the apparent geographic distribution of significant fossiliferous rocks in the study area, the Two Medicine and Judith River formations are

the areas where fossils are most likely to be affected in the Malmstrom AFB study area; the Two Medicine Formation is the more significant and fossiliferous of the two.

Paleontological resource distribution was summarized by a series of sensitivity zones which were delineated based on near surface and surface exposure of geologic units and the fossils they contain (Table 3.7.3-7). Areas of high sensitivity, or those in Zone 5, contain dense concentrations of unique, very well preserved fossils. The Willow Creek Anticline area (Egg Mountain) of the Two Medicine Formation, the Bear Gulch Limestone outcrop area, and the Middle Dome area of the Kootenai Formation were all classified as high sensitivity areas.

Geologic units in Zone 4, or those with a moderate sensitivity ranking, also contain important vertebrate fossils. However, fossils in these units may be dispersed rather than concentrated in well known, well preserved localities. Most of the geologic units in north-central Montana are Cretaceous in age. The Morrison Formation of Jurassic age and Quaternary deposits were also included in this category.

Geologic units characterized by a sparse distribution of vertebrate fossils throughout the unit are assigned to Zone 3. They include the limited Tertiary deposits in the area, and the Telegraph Creek Formation of Cretaceous age.

Areas with low sensitivity rankings, or those in Zone 2, are units containing invertebrates. A negligible sensitivity ranking (Zone 1) was given to strata with no fossils such as the Kibbey Sandstone of Mississippian age and volcanics of Cretaceous age. The sensitivity zones provide the basis for the impact assessment discussed in Chapter 4.0.

Table 3.7.3-7

Sensitivity Zones for Paleontological Resources

Sensitivity Zone	Locality or Geologic Unit	Age	Description
1	Volcanics and tuffs	Cretaceous	Non-fossiliferous geologic units
	Kibbey Sandstone	Mississippian	
2	Virgelle Sandstone	Cretaceous	Invertebrate fossils
	Colorado Shale	Cretaceous	
	Horsethief Sandstone	Cretaceous	
	Claggett Formation	Cretaceous	
	Mowry Shale	Cretaceous	
	Ellis Group	Jurassic	
	Amsden Formation	Pennsylvanian	
	Heath Shale	Mississippian	
	Otter Formation	Mississippian	
	Mission Canyon Limestone	Mississippian	
	Madison Limestone	Mississippian	
	Undifferentiated	Mississippian	
	Undifferentiated	Cambrian	
3	Undifferentiated	Tertiary	Important fossil-bearing geological units with sparse fossil distribution
	Telegraph Creek Formation	Cretaceous	
4	Terrace gravels, alluvium, sand dunes, and lacustrine deposits	Quaternary	Important fossil-bearing geological units with dispersed fossil distribution
	Two Medicine Formation	Cretaceous	
	Judith River Formation	Cretaceous	
	Kootenai Formation	Cretaceous	
	Marias River Shale	Cretaceous	
	St. Mary's Formation	Cretaceous	
	Eagle Sandstone	Cretaceous	
	Bearpaw Shale	Cretaceous	
	Morrison Formation	Jurassic	
5	Willow Creek Anticline Area, Two Medicine Formation	Cretaceous	Important fossil-bearing localities, dense concentrations of fossils
	Middle Dome Area, Kootenai Formation	Cretaceous	
	Bear Gulch Limestone	Mississippian	

3.8 Biological Resources and Threatened and Endangered Species

Deployment of the Small Intercontinental Ballistic Missile (ICBM) system at Malmstrom Air Force Base (AFB) may affect biological resources and threatened or endangered species. Construction of roads, stream crossings, buildings, and other facilities would disturb habitat and wildlife. The inmigrating construction and operations-related population would increase hunting and fishing pressure on existing resources, and program-induced development would result in additional habitat disturbance. Biological resources and threatened and endangered species are addressed under five elements: vegetation, wildlife, aquatic habitats, unique and sensitive habitats, and threatened and endangered species.

3.8.1 Resource Description

The biological resources discussed in this analysis are basically the same as those described in the Legislative Environmental Impact Statement (LEIS). The treatment of biological resources in this Environmental Impact Statement (EIS) differs from the LEIS in the level of analysis. For this study, all available site-specific information was used to make site-specific and regional conclusions about the status of biological resources. For the LEIS, the data were originally collected at the regional level.

3.8.1.1 Vegetation

The vegetation element addresses major vegetation types, limited to the formation, region, series, and association levels of vegetation classification. The formation level is primarily controlled by major climatic patterns and reflects a distinctive overall aspect or appearance (physiognomy), such as those of the grassland, woodland, or forest formations. The region-level classification reflects regional climatic or elevational differences, such as the difference between a montane forest and a subalpine forest. The series level considers several genera or species that are dominant within the local flora of a region (e.g., the limber pine series). The association level distinguishes a grouping of plants, usually two or three at a species level, such as the limber pine-bluebunch wheatgrass association. Locally or regionally important vegetation types that occur in areas where they could be affected by the proposed program are also addressed.

Vegetation described in this element is restricted to terrestrial types; wetland vegetation (species strictly dependent upon the aquatic habitat) is addressed in the aquatic habitats element. Riparian (water-edge) vegetation and phreatophytes (plants with long roots reaching to the water table such as mesquite and saltcedar), which are not strictly dependent on the aquatic habitat, are discussed in this element. In areas where native vegetation has been largely removed for agriculture or grazing, the historical or potential native vegetation is described.

3.8.1.2 Wildlife

Descriptions of wildlife focus on species or groups of species of high public, management, or scientific interest. Greatest emphasis is placed on big game, furbearers, upland game, waterfowl, and raptors, because impacts to these types of wildlife are most likely to be of concern. Important characteristics of nongame fauna are noted as appropriate (e.g., high diversity [the number of species and their relative abundance] of migratory birds, small mammals, or reptiles). Habitat types or localities that are of exceptional value or importance to wildlife (e.g., winter range and nesting sites) and that could be directly affected by program deployment are also identified in this section.

3.8.1.3 Aquatic Habitats

Aquatic habitats include both water-bearing habitats (e.g., streams, lakes, and ponds) and wetlands (e.g., marshes and riparian zones) because of their ecological similarity and the resident species that may be common to both. Greatest emphasis is placed on aquatic habitats that are likely to be affected by the proposed program and support recreational fisheries, substantial native fish populations, regionally important waterfowl or other wildlife populations, or important native plant populations. Less emphasis is given to aquatic habitats that do not meet these criteria and that represent otherwise common habitats (e.g., small marshy areas that have formed as a result of previous roadway or other construction, or ephemeral habitats that do not support species commonly associated with aquatic habitats).

3.8.1.4 Unique and Sensitive Habitats

Unique and sensitive habitats are defined as areas that are regionally uncommon, limited in areal extent, and that support specialized uses by wildlife, unique multiple-species complexes, or rare, threatened, or endangered species. In many cases, these habitats represent areas that have been identified by natural resource management agencies or recognized regional experts. In other cases, these habitats represent areas meeting special criteria that were identified during the analysis. Greatest emphasis is given to unique and sensitive habitats that are likely to be altered by the proposed program and to habitats that are not regulated by natural resource management agencies.

3.8.1.5 Threatened and Endangered Species

The threatened and endangered species section focuses on plant and animal species that are federally listed as threatened or endangered and species that are proposed or candidates for federal listing. Montana-recognized species are also addressed. Important characteristics of threatened and endangered species (e.g., wintering areas, nesting sites, and high densities) are described. Designated critical habitats are also included.

3.8.2 General Analysis Methodology

3.8.2.1 Region of Influence

The Region of Influence (ROI) for biological resources and threatened and endangered species is defined as the areas or locations where these resources can reasonably be expected to be directly or indirectly affected by construction or operations of the proposed program. For biological resources, it is important to distinguish between areas and resources that may be subject to direct surface disturbance and other direct impacts from construction and operations, and areas where only indirect program impacts could occur as a result of increased recreation and program-induced development. Selection of the ROI relied on detailed information about construction and operations that was not available for the LEIS. For Malmstrom AFB, areas of direct surface disturbance include the onbase locations where Small ICBM facilities will be built, areas adjacent to Hard Mobile Launcher (HML) transporter/erector (T/E) routes and access roads that will be upgraded, areas adjacent to launch facilities and launch control facilities, and areas adjacent to bridge improvement sites.

Indirect impacts may occur where program-induced development is expected, or where program-induced recreational use will affect biological resources. The factors used in defining indirect impact areas were (1) the location of the base and the principal

population centers where program-induced inmigrants are likely to reside (Great Falls, Montana); (2) the location of recreational facilities, biological resources of special interest or sensitivity, or other resources likely to attract visitors; and (3) the assumption that numbers of inmigrants sufficient to affect biological resources are not likely to travel more than 150 road miles or 3 driving hours from home to pursue short-term recreational or other outdoor activities. Therefore, the shape and extent of this area depends on the layout and type of roads in the area and the location of recreational facilities and biological resources of special sensitivity or interest. It is actually these points or features of interest that were analyzed, rather than the entire area included within the ROI boundary. Specific features in the ROI include Glacier National Park, the Rocky Mountain Front Range, the Missouri River (from Townsend to Charles M. Russell National Wildlife Refuge), the Yellowstone River (from Springdale to near Billings), and streams, reservoirs, national wildlife refuges, and national forests within commuting distance.

The extent of the ROI was adjusted to take into account any expected remote, program-related population centers in the region such as construction dispatch stations and the more remote residential areas. These additional population centers are within the deployment area; therefore, the ROI boundary was adjusted to include those important recreational areas that occur within 1-hour driving time of these remote, program-related population centers.

3.8.2.2 Vegetation

For Malmstrom AFB, major vegetation types occurring along the T/E routes, along launch facility access roads, and around the launch facilities and launch control facilities were described, mapped, and incorporated into a computerized Geographic Information System (GIS). Present vegetation was mapped using 1:24,000 color aerial photographs, 1:62,500 color infrared photographs, and existing vegetation and land use maps. Maps included important physical and legal features such as surface water bodies, topography, and highways and roads. The major vegetation types and locally important types were described in detail using information obtained from published reports. Expected recovery rates or recovery potentials for the major vegetation types and for unique communities in the areas of direct surface disturbance were described when possible. The major vegetation types common to the indirect impact area were described but not mapped. Factors such as potential soil erosion and programed recreational use were also considered in this element. However, consideration of these factors was confined to their relationship to vegetation. Projected recreational use and soil erosion are discussed in Sections 3.5 (Recreation) and 3.10 (Geology and Soils), respectively.

3.8.2.3 Wildlife

Baseline conditions for wildlife resources at Malmstrom AFB and in the deployment area were determined through a comprehensive review of existing data and from site-specific field studies. Field surveys were used selectively to determine the status of key species in areas of direct surface disturbance and to fill particularly important data gaps. Existing data sources used in the analysis included various reports, EISs, annual harvest reports, research documents, and distribution maps from the U.S. Fish and Wildlife Service (USFWS), Montana Department of Fish, Wildlife and Parks, the Bureau of Land Management (BLM), the U.S. Forest Service, and state universities. Additional data sources included specific journals and theses.

Primary attention was given to big game, raptors, waterfowl, and upland game. Highly sensitive species that may be affected by the proposed program were identified, and their habitats were given special attention. Specific attributes used to assess baseline conditions for wildlife species included geographic distributions, species composition, species diversity, behavioral sensitivity, and relative abundance or density.

Density estimates for wildlife species are the preferred measurements; however, these estimates are not readily available for many species. Where possible, distribution and habitat information derived from existing data and field surveys were used to prepare distribution maps for key game species. Locations of key habitats (e.g., winter and summer ranges) were also noted. Important characteristics of nongame species (e.g., exceptional numbers or concentration of migratory birds) were addressed and incorporated into the evaluation process where appropriate. Predictions of the conditions of wildlife populations without the proposed program were accomplished through analysis of future habitat availability and conditions, potential patterns of population growth, and regional development projects that may be planned for the area.

3.8.2.4 Aquatic Habitats

All aquatic habitats occurring at bridge improvement sites, along T/E routes and access roads, and adjacent to launch facilities were identified. The quality of fisheries in these habitats was determined using the Montana Department of Fish, Wildlife and Parks fisheries data base where applicable. The descriptive information in this data base is used by the department to rank streams based on their habitat, sport fishery, and overall resource values. Each stream in the data base has been ranked in one of five categories for each of these three resource values. These rankings are relative to the high quality conditions in Montana. Therefore, a rank of moderate or limited resource value (the two lowest potential values) in the Montana Department of Fish, Wildlife and Parks data base still represents a reasonably important resource on a national scale. Determinations for streams in this data base, as well as determinations for aquatic habitats not in this data base, were supplemented through literature review. Direct field observation was used to supplement and confirm these ratings. The quality of wetland habitats was determined from direct observation, literature review, and comments from local experts (e.g., USFWS, Montana Department of Fish, Wildlife and Parks, and experts from universities). The status of other aquatic species (e.g., aquatic insects, clams, and snails) was considered a function of the overall aquatic habitat and fisheries value. The importance of aquatic habitats to species such as waterfowl was determined through direct observation and based on comments from natural resource management agencies. This information was stored in a tabular data base and associated with bridge improvement sites, T/E route and access road sections, and launch facilities in the GIS. These data were used to describe the amount and quality of aquatic habitats that may be disturbed by the proposed program. Major aquatic habitats in the ROI that are used for recreation or that may be affected by factors such as population growth were treated in a similar manner. Portions of this element are related to elements of geology and soils, water resources, and recreation. For the biological resources analysis, factors such as soil erosion, water quality, and recreational use were considered only as they apply to the biological aspects of aquatic habitats.

3.8.2.5 Unique and Sensitive Habitats

Unique and sensitive habitats were identified through interviews with natural resource management agencies and informed local experts (e.g., the Montana Department of Fish, Wildlife and Parks, the Montana Natural Heritage Program [MNHP], the USFWS, and the

Nature Conservancy) and through direct analysis of habitats in the potential impact areas. Major unique habitats (e.g., national wildlife refuges) were identified in the LEIS. This data base was augmented to include all habitats appropriate to this site-specific analysis. Each habitat's unique qualities, degree of legal protection (if any), and likelihood for improvement or degradation in the future (as a result of nonprogram-related activities) were described. Unique and sensitive habitats in the deployment area that are likely to be altered because of proposed program activities (such as construction) were noted. Unique and sensitive habitats that are major recreational areas or are in locations that may be developed because of population-induced growth were also identified. This information and locational descriptions were stored in a tabular data base.

3.8.2.6 Threatened and Endangered Species

Species considered in this section include federally listed threatened and endangered species, proposed species, and federal-candidate species (Table 3.8.2-1), as well as species given special state and global status by the MNHP. Occurrences of threatened and endangered species were compiled from data supplied by the USFWS, Montana Department of Fish, Wildlife and Parks, the MNHP, and base environmental personnel. Other sources included the BLM and state universities. Information from the MNHP provided the basis for the discussion of threatened and endangered plant species. The MNHP is contracted by the State of Montana to inventory plant and animal species and plant associations which are rare, endemic, disjunct, threatened, or endangered throughout their range or in Montana. Although Montana-recognized species have no formal legal protection, they receive appropriate consideration during environmental planning. Montana-recognized taxa are ranked by a standardized procedure used in 44 other state heritage programs. Rankings are based on the rangewide species or global rarity, and on their rarity within the state, using the ranking categories defined in Table 3.8.2-2. Comprehensive tabulations of federally listed species, species proposed for federal listing, species that are candidates for federal listing, and Montana-recognized species that are located in the areas of direct surface disturbance and areas that may receive indirect impacts were compiled. The list developed for the LEIS was revised and updated.

Special attention was given to threatened and endangered species that are thought to occur within the deployment area. Where possible, specific locations of threatened and endangered species were mapped. The USFWS-designated critical habitats, permanent habitats, and important habitats used on a seasonal or transitory basis were also mapped. Site-specific field studies were conducted to verify threatened and endangered species locations and to locate additional species where possible. Any designated critical habitats were also mapped.

Information regarding regional and site-specific distributions, abundance, population status and prognosis, habitat requirements, recovery plans, and importance to national populations were reviewed for each threatened and endangered species that may be affected by the proposed program.

3.8.3 Existing and Future Baseline Conditions

3.8.3.1 Vegetation

Malmstrom AFB lies within a grassland biome. Prior to the development of base facilities, the area was used as farmland. The undeveloped portion of the base has been seeded to rye and crested wheatgrass to control erosion. Trees have been planted

Table 3.8.2-1

Federal Threatened and Endangered Species Categories

Category	Definition
Endangered	Taxa threatened with extinction throughout all or a significant portion of their range.
Threatened	Taxa likely to become endangered in the foreseeable future.
Proposed Endangered	Taxa proposed to be formally listed as endangered.
Proposed Threatened	Taxa proposed to be formally listed as threatened.
Category 1	Taxa for which the USFWS currently has on file substantial information on biological vulnerability and threat(s) to support the appropriateness of proposing to list them as endangered or threatened species. Presently, data are being gathered concerning precise boundaries for critical habitat designations. Development and publication of proposed rules on these taxa are anticipated, but because of the large number of such taxa, it could take several years before they are published. Also included in Category 1 are plant taxa whose status in the recent past is known, but may already have become extinct. These plants may retain a high priority for addition to the list subject to the confirmation of extant populations.
Category 2	Taxa for which information now in possession of the USFWS indicates that proposing to list them as endangered or threatened species is possibly appropriate, but for which substantial data on biological vulnerability and threat(s) are not currently known or on file to support the immediate preparation of rules. Also included in Category 2 are plant taxa that are possibly extinct and taxonomically questionable taxa that are believed extinct in the wild, but are extant in cultivation. It is likely that some of these will not warrant listing, while others will be found to be in greater danger of extinction than some taxa in Category 1.
Category 3A	Taxa for which the USFWS has persuasive evidence of extinction. If rediscovered, however, such taxa might acquire high priority for listing. At this time, the best available information indicates that the taxa included in this subcategory, or the habitats from which they were known, are in fact extinct or destroyed, respectively.

Table 3.8.2-1 Continued, Page 2 of 2

Category	Definition
Category 3B	Names that, on the basis of current taxonomic understanding, usually as represented in published revisions and monographs, do not represent taxa meeting the USFWS definition of "species." Such supposed taxa could be reevaluated in the future on the basis of subsequent research.
Category 3C	Taxa that have proven to be more abundant or widespread than was previously believed and/or those that are not subject to any identifiable threat. Should further research or changes in land use indicate significant decline in any of these taxa, they may be reevaluated for possible inclusion in Categories 1 or 2.

Note: The taxa in Categories 1 and 2 are candidates for possible addition to the List of Endangered and Threatened Species. The USFWS encourages their consideration in environmental planning, such as in environmental impact analysis under the National Environmental Policy Act, 40 CFR 1500-1508.

Table 3.8.2-2

Montana Natural Heritage Program
Threatened and Endangered Species Categories

Category	Definition
Global Rank	
G1	Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very few remaining individuals) or because of some factor of its biology making it especially vulnerable to extinction. (Critically endangered throughout range.)
G2	Imperiled globally because of rarity (6 to 20 occurrences) or because of other factors demonstrably making it vulnerable to extinction throughout its range. (Endangered throughout range.)
G3	Either very rare throughout its range or found locally (even abundant at some of its locations) in a restricted range, or because of other factors making it vulnerable to extinction throughout its range; in the range of 21 to 100 occurrences. (Threatened throughout range.)
G4	Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.
G5	Demonstrably secure globally, though it may be quite rare in parts of its range, especially at periphery.
GU	Possibly in peril rangewide, but status uncertain; more information needed.
GH	Historically known, may be rediscovered.
GX	Believed to be extinct throughout range; historical records only, continue search.
State Rank	
S1	Critically imperiled in Montana because of extreme rarity (5 or fewer occurrences or very few remaining individuals) or because of some factor of its biology making it especially vulnerable to extirpation from Montana. (Critically endangered in Montana.)
S2	Imperiled in Montana because of rarity (6 to 20 occurrences) or because of other factors demonstrably making it very vulnerable to extirpation from Montana. (Endangered in Montana.)
S3	Rare in Montana (on the order of 20 or more occurrences). (Threatened in Montana.)
S4	Apparently secure in Montana.
S5	Demonstrably secure in Montana.
SU	Possibly in peril in Montana, but status uncertain; more information needed.
SH	Historically known in Montana; may be rediscovered.
SX	Apparently extirpated from Montana.

throughout the cantonment area, along streets, and in open areas; common species include green ash, American elm, plains cottonwood, honey locust, Russian olive, willow, Scotch pine, and Colorado blue spruce. Shrubs used in landscaping include caragana, dogwood, and lilac.

Much of the deployment area, once covered by native grassland, has been converted to agriculture and presently produces wheat, alfalfa, and barley. Approximately 61 percent of the area along T/E routes which are most likely to receive improvement and access roads is cropland, while 38 percent supports native vegetation. Much of the native vegetation occurring in the deployment area is characterized as mixed-grass prairie. The most common grassland type in the deployment area is the grama-needlegrass-wheatgrass type. Principal species include blue grama, needle-and-thread, western wheatgrass, bluebunch wheatgrass, and sedges. Large amounts of Sandberg bluegrass and prairie junegrass are distinguishing characteristics of this grassland type. Blue grama, fringed sagewort and annual species increase on overgrazed sites.

A foothills grassland type occurs more extensively in foothills and mountains of the southern and western parts of the ROI. A distinguishing feature of the foothill grasslands is the admixture of plains and mountain species. Dominants include bluebunch wheatgrass, fescues, and needle-and-thread grass. Shrub and tree-covered canyons from higher elevations extend into this type. Hawthorne, serviceberry, snowberry, rose, and quaking aspen are common woody species. A third plains grassland type is encountered occasionally in the easternmost part of the deployment area, and is dominated by western wheatgrass, needle-and-thread, blue grama, and green needlegrass.

Transitions from lower elevations to mountains support rolling grassland interspersed with patches of timber. The mountains of the southern and western parts of the ROI are dominated by coniferous forests. Ponderosa pine types border grassland areas. Islands of ponderosa pine, Douglas fir, and spruce also occur on hilly or rough, broken land throughout the grassland plains. Juniper is often associated with this type. Other forest types in the western and southern parts of the ROI are the lodgepole pine-Douglas fir type, which is widespread at intermediate elevations, and a western larch-Douglas fir type. Subalpine forests of subalpine fir, Engelmann spruce, and white-bark pine occur at higher elevations.

Future baseline military activities onbase (e.g., including the KC-135R air refueling mission) may result in disturbance of native vegetation. No major losses of native vegetation in the deployment area or the ROI are expected to result from urban or agricultural expansion. Livestock grazing will continue to affect the composition and production of rangeland vegetation. Minor disturbance of both native vegetation and agricultural land may result from construction of transmission lines.

3.8.3.2 Wildlife

The vegetation types that occur throughout the deployment area provide habitat for numerous wildlife species. Several big game species occur in the deployment area, including mule deer, white-tailed deer, pronghorn, elk, bighorn sheep, and black bear. These species provide important recreation for hunters in the region, as well as for those who pursue nonconsumptive activities such as wildlife photography.

Mule deer occur primarily in mixed habitats such as foothills, mountains, and semi-open forests. High-density wintering areas (areas where large numbers of deer congregate during winter) for this species are known to occur in a variety of habitats in the

deployment area. However, most are located along major drainages such as the Missouri, Marias, and Teton rivers (Figure 3.8.3-1). Additionally, both general and high-density wintering habitats are located in the foothills along the Rocky Mountain Front Range and along the northern portion of the Little Belt Mountains. White-tailed deer occur throughout the deployment area and are most abundant in forest areas and riparian habitats with relatively dense undergrowth. White-tailed deer wintering habitats occur along various river drainages, as well as near the Big Snowy Mountains, Judith Mountains, and along the northwest portion of the Little Belt Mountains (Figure 3.8.3-2). Pronghorn are restricted to open grassland and sagebrush habitats with main concentrations occurring primarily in the eastern portion of the deployment area. Severe wintering habitats (areas where big game congregate during the most severe winter months) are found near Schrammeck Lake, south of Round and Square buttes, and east of the Judith Mountains (Figure 3.8.3-3). General wintering habitats also occur in the rolling grasslands east of the Rocky Mountains.

Additional big game species that occur within the areas of direct surface disturbance include elk and black bear. Elk summer range includes mountain forests and meadows; during winter, elk occur mainly on lower wooded slopes and valleys (Figure 3.8.3-4). Black bears occur primarily in forests that have abundant understory, which provides both cover and food sources. Bighorn sheep are primarily restricted to the mountainous areas along the Rocky Mountain Front Range (Figure 3.8.3-5) in the western portion of the ROI. Additional bighorn sheep populations occur in the Beartooth State Recreation Area near Holter Lake. Moose are restricted to wetland/riparian habitats along the major drainages in the ROI. Mountain goats also occur in mountainous areas within the ROI.

In addition to the big game species, other game species are known to occur in the deployment area. Upland game species and associated habitats include blue grouse (coniferous forest), ruffed grouse (mixed forest), spruce grouse (spruce and lodgepole pine forests), and sharp-tailed grouse (prairie and forest edges). Additional game bird species include sage grouse (grassland), gray partridge (grassland), wild turkey (forest and broken woodland), ring-necked pheasant (farmland), and mourning dove (grassland and open woods). Migratory waterfowl also occur in the region and are dependent on the rivers, lakes, and ponds scattered throughout the area (Table 3.8.3-1). Duck and goose nesting and wintering areas are concentrated along the major rivers, at Benton Lake National Wildlife Refuge, and Freezeout Lake Wildlife Management Area.

The region also supports numerous furbearers including mink, marten, fisher, river otter, muskrat, raccoon, badger, and skunk. Mink, river otter, and raccoon are found primarily in riparian habitats, while the marten and fisher inhabit coniferous forests. Badgers occur in open grassland areas; muskrats occur in rivers, streams, and lakes; and skunks are found in many different types of habitats. Predators such as the coyote, mountain lion, bobcat, and red fox also occur in the deployment area. The mountain lion is restricted to the more mountainous areas, and the bobcat is found in foothill and canyon areas with dense vegetation. Both the coyote and red fox are adapted to a variety of habitats including the plains and forested areas.

Smaller species of mammals occur in virtually every habitat within the areas of direct surface disturbance. Species such as the jackrabbit, ground squirrels, the black-tailed prairie dog, and various species of harvest mice are found primarily in grassland and sagebrush communities. Species such as shrews and voles may be found in a wide variety of areas, including mountains, prairies, and riparian habitats.

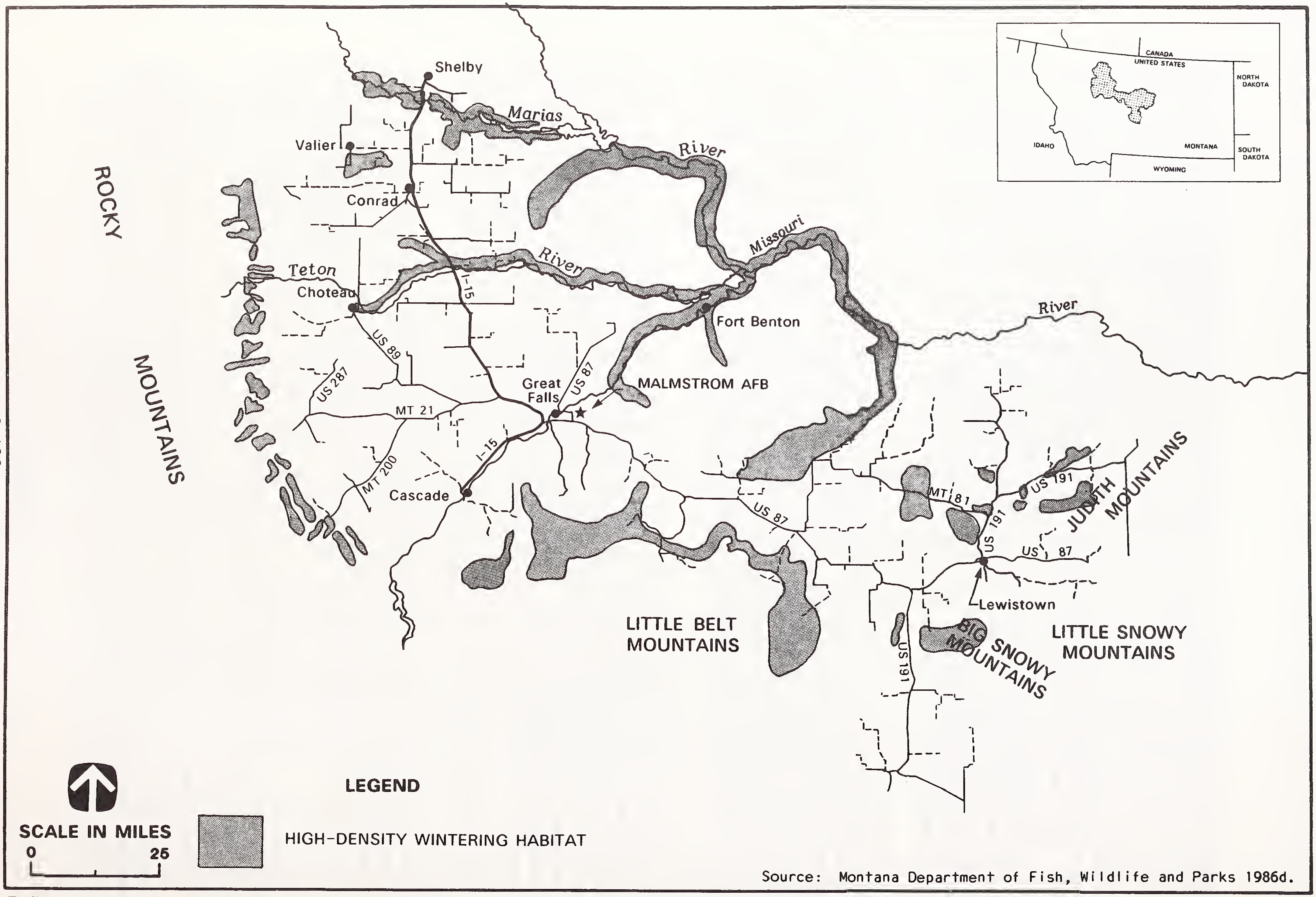


FIGURE 3.8.3-1 MULE DEER HIGH-DENSITY WINTERING HABITAT IN THE DEPLOYMENT AREA

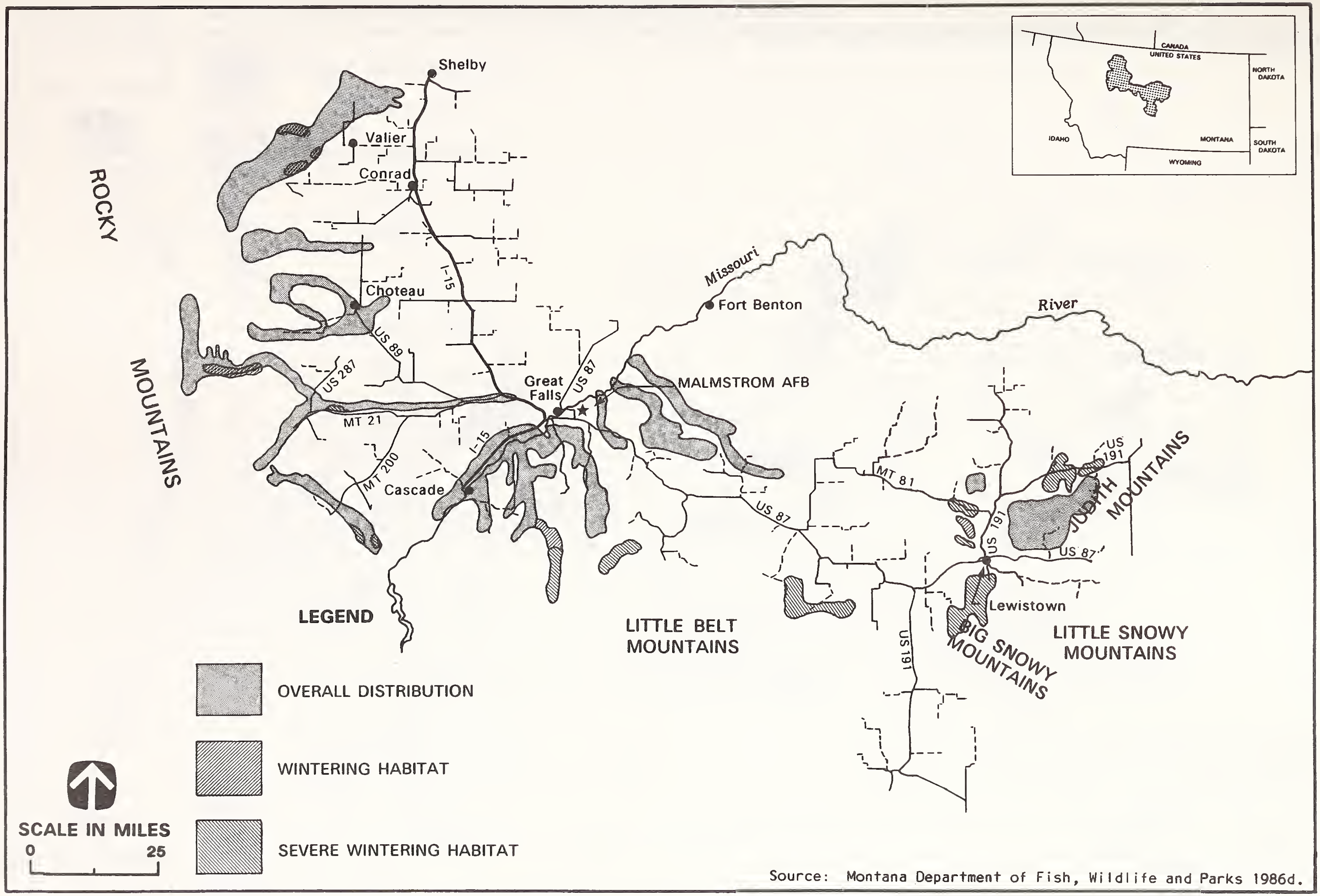


FIGURE 3.8.3-2 WHITE-TAILED DEER WINTERING HABITAT IN THE DEPLOYMENT AREA

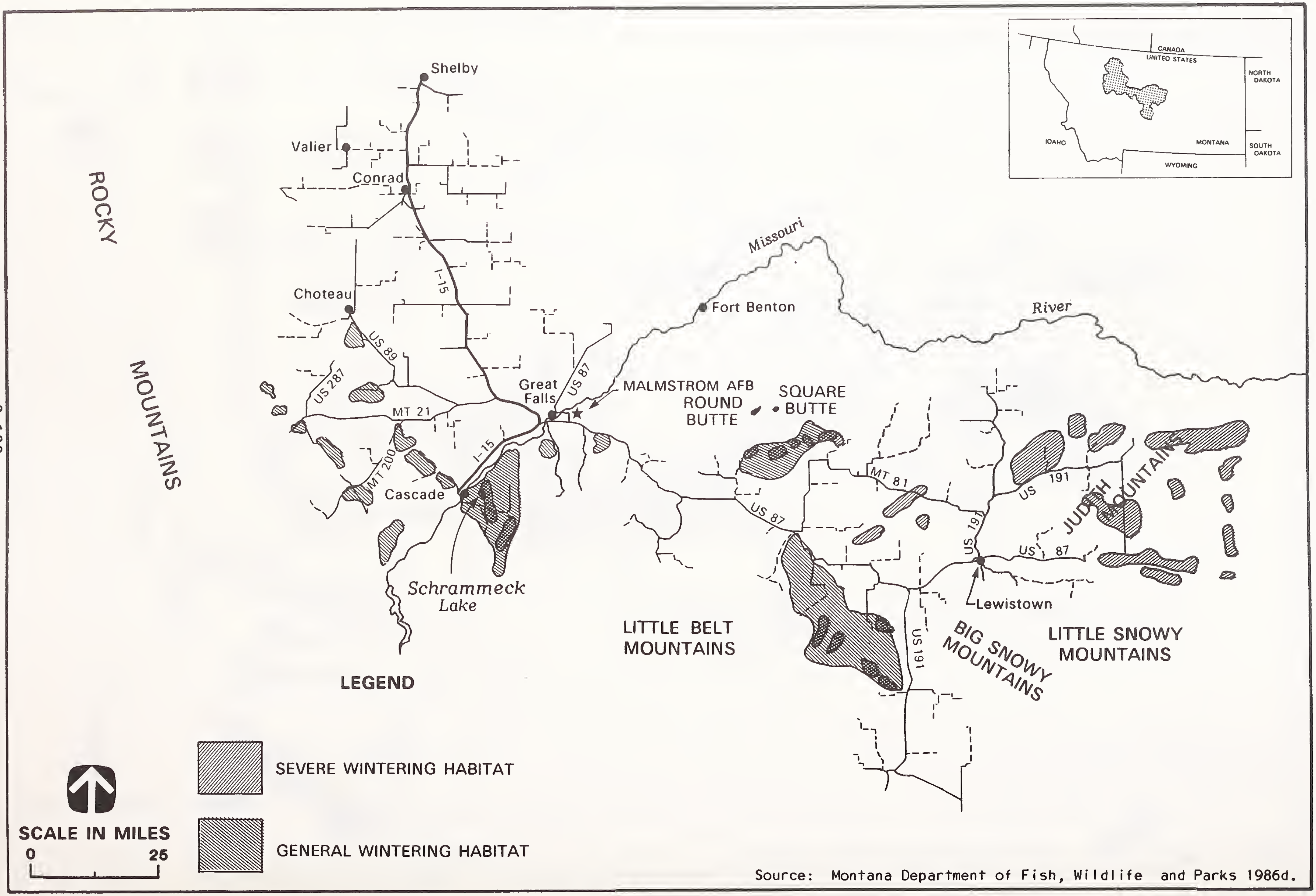
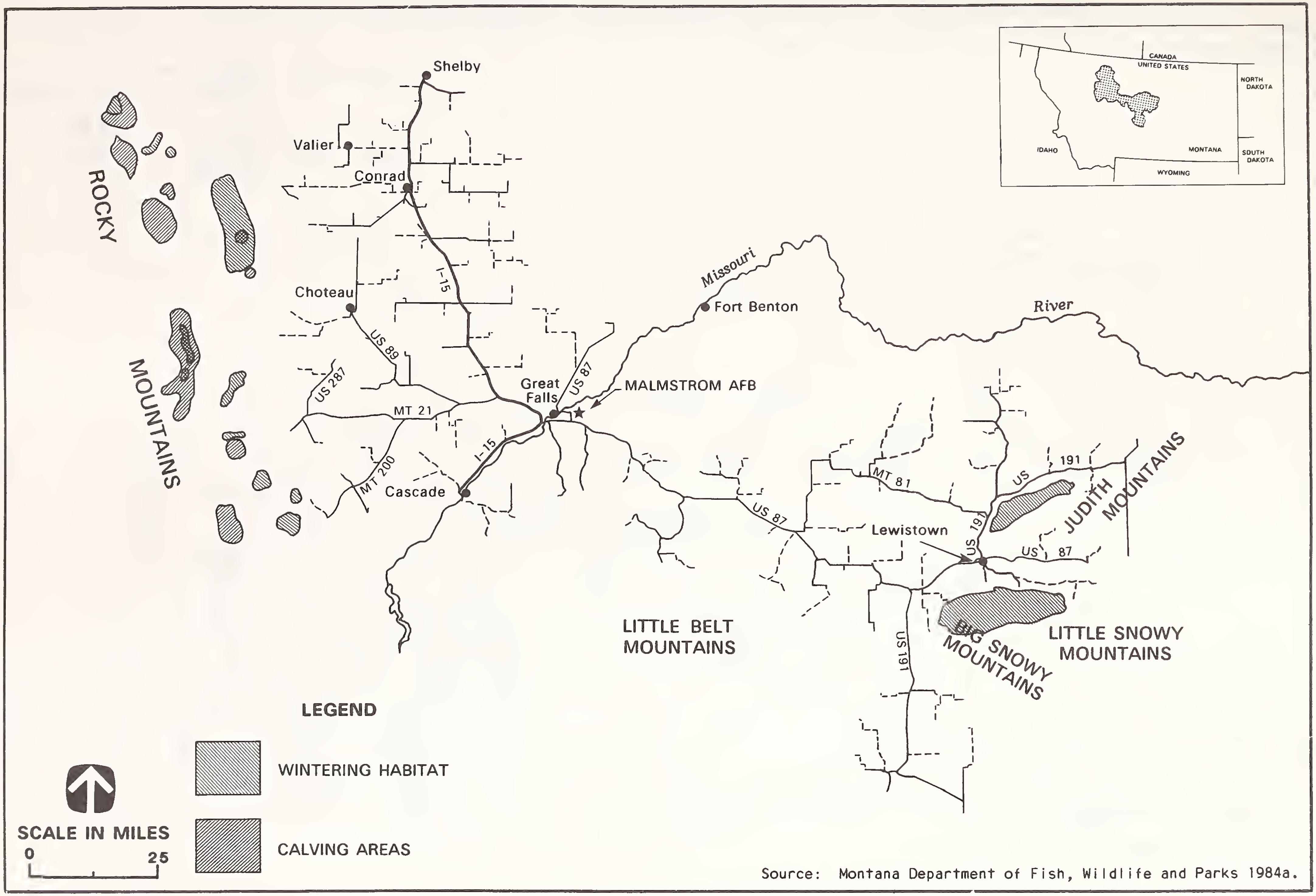


FIGURE 3.8.3-3 PRONGHORN WINTERING HABITAT IN THE DEPLOYMENT AREA



Source: Montana Department of Fish, Wildlife and Parks 1984a.

FIGURE 3.8.3-4 ELK WINTERING HABITAT AND CALVING AREAS IN THE DEPLOYMENT AREA

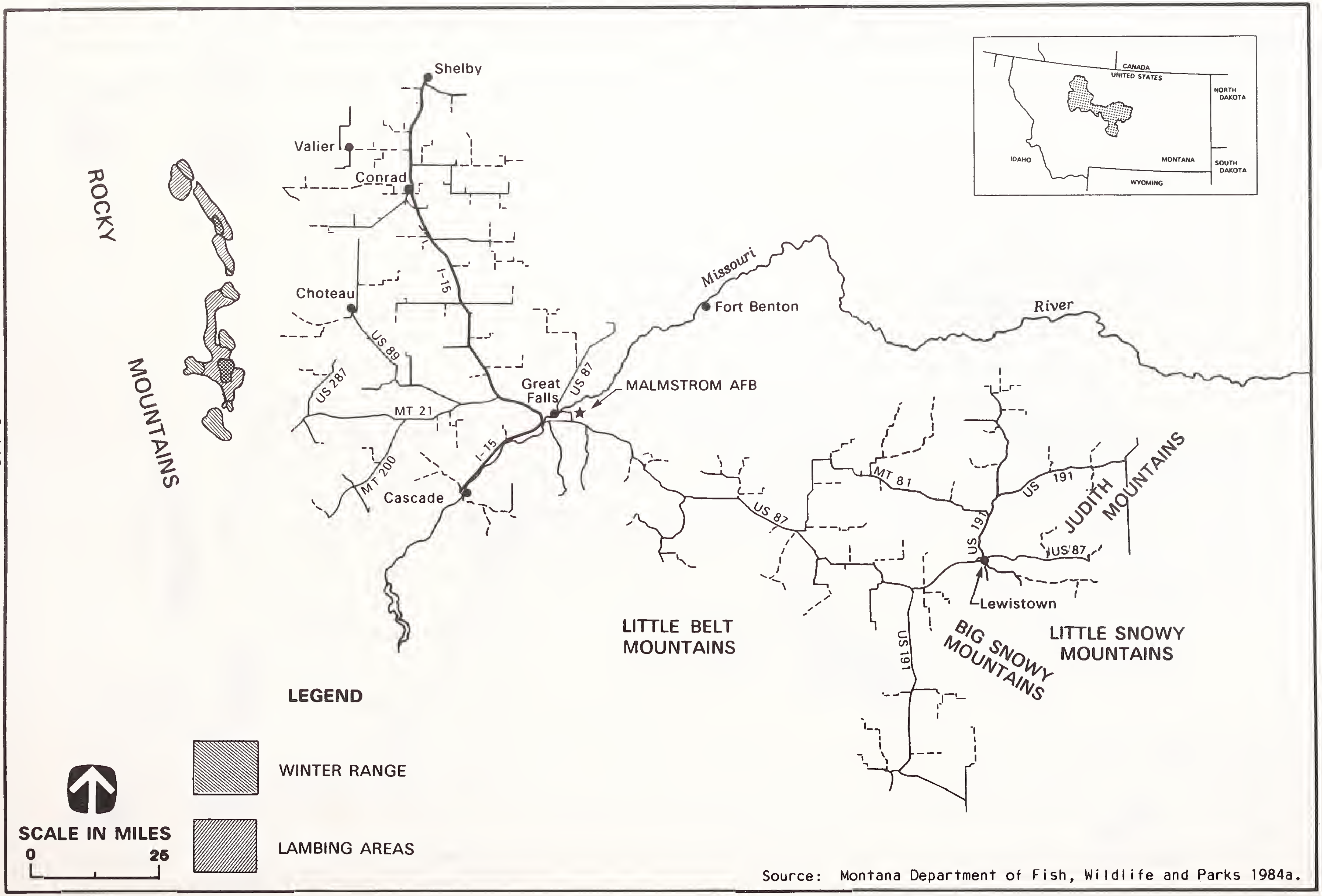


FIGURE 3.8.3-5 BIGHORN SHEEP WINTERING HABITAT AND LAMBING AREAS IN THE DEPLOYMENT AREA

Table 3.8.3-1

Waterfowl Commonly Occurring in the Deployment Area and Region of Influence

Common Name	Scientific Name
American widgeon	Anas americana
Blue-winged teal	Anas discors
Canada goose	Branta canadensis
Canvasback	Aythya valisineria
Cinnamon teal	Anas quiscula
Gadwall	Anas strepera
Green-winged teal	Anas crecca
Mallard	Anas platyrhynchos
Northern shoveler	Anas clypeata
Pintail	Anas acuta
Redhead	Aythya americana
Ross' goose	Chen rossii
Snow goose	Chen caerulescens

The wildlife habitats within the deployment area also support a diverse group of bird species. The common loon, horned grebe, western grebe, and double-crested cormorant are a few of the bird species inhabiting the lakes and rivers in the region. An abundance of shorebirds, such as the spotted sandpiper, willet, and American avocet, also occur in wetland areas. The coniferous forests provide valuable habitat for numerous bird species including hummingbirds, flycatchers, sparrows, grouse, and woodpeckers. In addition, many raptor species such as the northern goshawk, Cooper's hawk, northern harrier, rough-legged hawk, and red-tailed hawk are found in the deployment area.

The study area does not support a diverse group of herpetofauna (reptiles and amphibians). The rivers, streams, and ponds do support a few turtle species (snapping turtle, western painted turtle, and ornate box turtle), as well as one salamander species and five frog species. Lizard species, such as sagebrush lizard and prairie lizard, are fairly common in the prairie and sagebrush areas. The bullsnake, western garter snake, and prairie rattlesnake also occur in the area.

Future baseline military activities onbase (including the KC-135R air refueling mission) as well as within the deployment area, are not expected to adversely affect the status of wildlife. However, any military or civilian population increases may cause increased hunting pressure. Any significant increase in hunting will be of particular importance for those areas in the region already receiving high hunting pressure (such as the Highwood

and Little Belt mountains). Urban expansion and agricultural activities are not expected to adversely affect wildlife in the future.

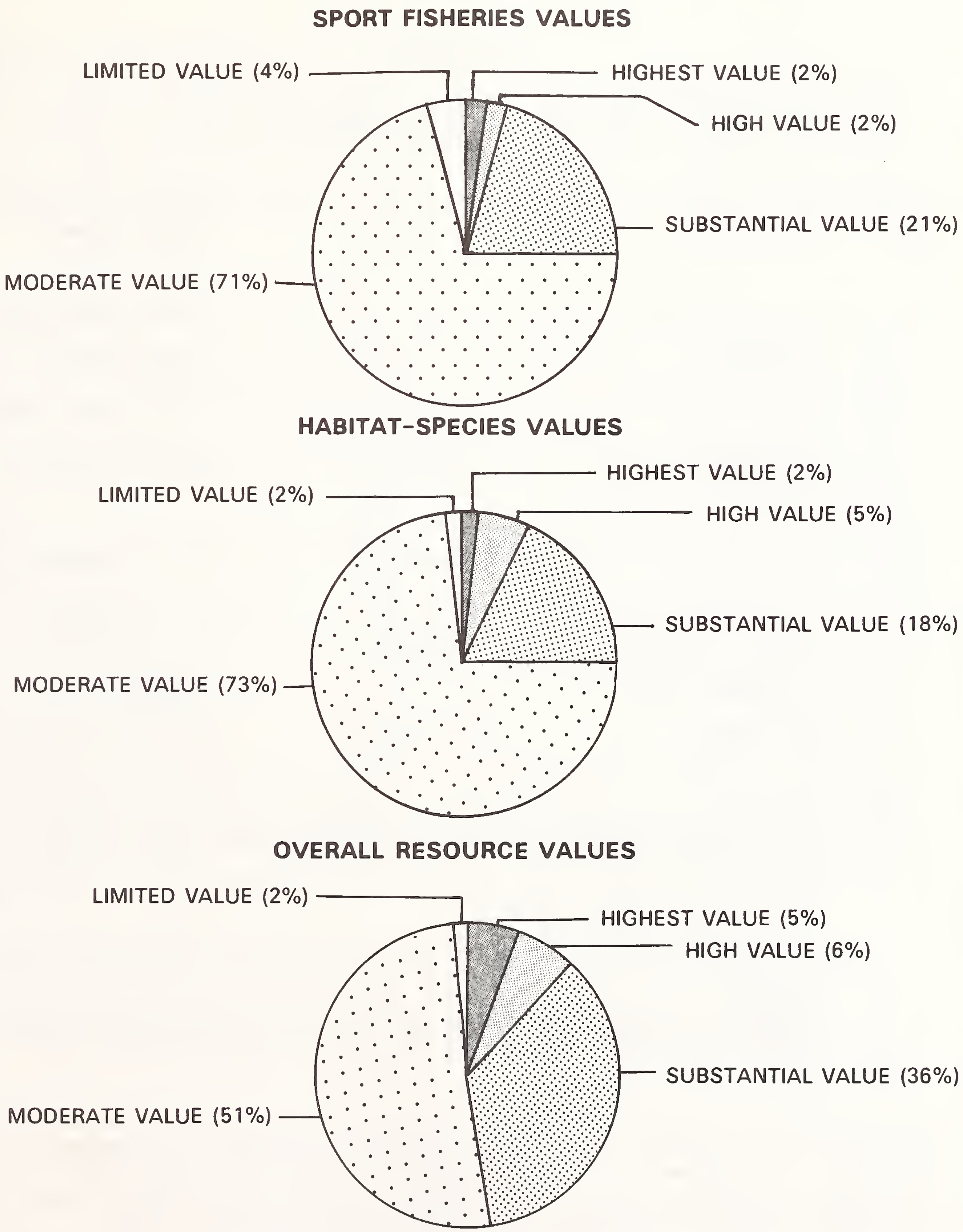
3.8.3.3 Aquatic Habitats

Malmstrom AFB lies on a broad plateau that does not contain any major wetlands. Only one artificial pond and one small wetland occur onbase. Several major rivers, including the Missouri, Sun, Dearborn, Teton, Marias, Judith, and Musselshell, flow through the deployment area. These drainages support substantial fisheries and riparian wetlands. Numerous wetlands and prairie potholes occur in the northwestern one-third of the deployment area and include Benton Lake, Blackhorse Lake, and Freezeout Lake. The remaining ROI includes a number of excellent fisheries and wetlands, west of Great Falls, along the Rocky Mountain Front Range, and within the northern drainage of the Yellowstone River. Fishing is the dominant outdoor recreational activity in the ROI because of these aquatic assets.

Wetlands. One small wetland area occurs on Malmstrom AFB; it consists of ponded water and cattails in a drainage near the Weapons Storage Area. Riparian forests of cottonwood, box elder, and willow are common in the floodplains of the major drainages throughout the deployment area. Smaller streams tend to support shrubby riparian species such as willows. Emergent herbaceous plants such as cattails are found in essentially all wetlands in the area. Most of the deployment area is used for agriculture and the remaining riparian wetlands are important to waterfowl and other species (especially in the deployment area east of Great Falls, which lacks other major types of wetlands).

Swamps, ponds, and prairie potholes are common in the deployment area northwest of Great Falls and represent a major supplement to riparian wetlands in that area. This portion of the deployment area is a major waterfowl flyway because of Benton Lake, Blackhorse Lake, Freezeout Lake, and numerous other wetlands. Many of these wetlands are maintained as easements or fee-owned lands by the USFWS. This wetland region extends to the border of the ROI, north of Shelby. Riverine riparian zones form the dominant wetland habitat in the remaining ROI along the Rocky Mountain Front Range, the Big and Little Belt mountains, and in the plains of the northeastern portion of the ROI.

Aquatic Biota. The artificial pond in the Pow Wow Recreation Area onbase is occasionally stocked with trout and serves as a children's fishery. The T/E routes and access roads cross or run along a large number of streams in the deployment area. These streams are generally ranked as moderate to substantial fisheries resources with respect to habitat and overall resource values in the Montana Department of Fish, Wildlife and Parks fisheries data base (Figure 3.8.3-6), and as moderate fisheries resources for sport fisheries (though a large number are of substantial value). Although the overall ranking is somewhat low because of the large number of small streams in the deployment area, a relatively large number of the streams are ranked as high-value and outstanding fisheries resources with respect to habitat, sport fisheries, and overall resource values. Because of the relative nature of these rankings and the extremely high quality of the highest categories, even the limited fisheries resources represent natural resources of concern to the Montana Department of Fish, Wildlife and Parks. Many sport fish and several species of special concern to the department (Table 3.8.3-2) occur in the ROI. From the southwestern portion of the deployment area to the northeastern portion, there is a general trend from coldwater to warmwater fisheries. This trend extends into the remaining ROI. "Blue-ribbon" trout streams occur along stretches of the Missouri River



Source: Montana Department of Fish, Wildlife, and Parks 1986c.

EM3-BR/1

FIGURE 3.8.3-6 DISTRIBUTION OF STREAM VALUE CLASSES IN THE DEPLOYMENT AREA

Table 3.8.3-2

Montana Fish of Special Concern[1] That May Occur Within the Region of Influence

Class[2]	Common Name	Family	Scientific Name
A	Arctic grayling	Salmonidae	Thymallus arcticus
	Paddlefish	Polydontidae	Polydon spathula
	Pallid sturgeon	Acipenseridae	Scaphirhyncus albus
	Westslope cutthroat trout	Salmonidae	Salmo clarki lewisi
B	Bull trout	Salmonidae	Salvelinus confluentus
	Native rainbow trout	Salmonidae	Salmo gairdneri
C	Northern redbelly dace x finescale dace	Cyprinidae	Phoxinus eos x P. neogaeus
	Pearl dace	Cyprinidae	Semotilus margarita

Note: [1]A watch list of important species agreed upon by the Montana Chapter of the American Fisheries Society and the Montana Department of Fish, Wildlife and Parks.

[2]Class A species have limited numbers and/or habitats in Montana. Their loss in Montana would be significant.

Class B species have limited numbers and/or habitats in Montana, but may be abundant elsewhere. Their loss would be of moderate concern in Montana.

Class C species have limited numbers and/or habitats in Montana, but are abundant elsewhere. Their loss would be of minor concern in Montana.

and its tributaries and along the Rocky Mountain Front Range in the remaining ROI. In general, the fisheries rating of a stream is indicative of the quality of other portions of the aquatic biota because the fish are dependent on aquatic insects and smaller fish as food sources. Amphibians are abundant in many of the wetland habitats that do not support fisheries (e.g., the pond and pothole region northwest of Great Falls).

Future baseline activities onbase (e.g., the KC-135R air refueling mission) and at the launch facilities are not expected to affect the future status of aquatic resources in the deployment area. Normal road improvement and bridge upgrading and replacement are expected to occur in the vicinity of the base and in the deployment area. These activities are not expected to occur in large-scale, short-term improvement programs

and should have little overall impact on the aquatic habitats of the area. State plans call for aquatic resource enhancement to provide for the following increases in recreational fishing by 1990: salmonids in streams, 12 percent; salmonids in lakes, 12 percent; coolwater species in streams, 20 percent; and cool and warmwater species in lakes, 39 percent. These enhancement factors are well within projected increase-in-use rates for Montana. Restrictions may also be placed on specific waters, when necessary, to maintain high-quality aquatic resources.

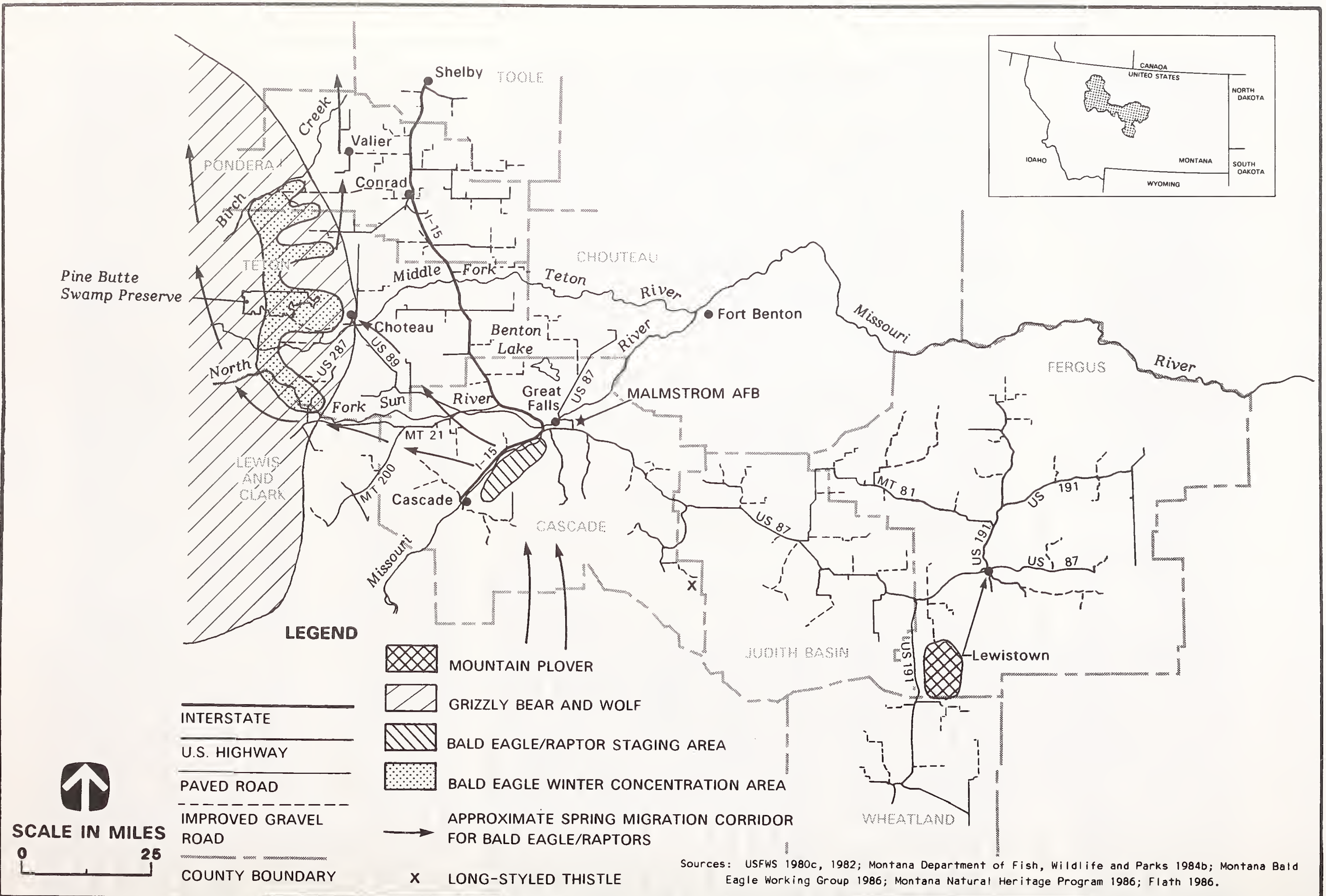
3.8.3.4 Unique and Sensitive Habitats

No areas on Malmstrom AFB qualify as unique and sensitive habitats from a local or regional perspective. In addition, no unique and sensitive habitats have been identified immediately adjacent to launch facilities. Launch facility F-10 is near the southeastern boundary of the Pine Butte Swamp Preserve. Pine Butte Swamp is a major wetland and grizzly bear sanctuary. Freezeout Lake, a state-managed waterfowl refuge, and Blackhorse Lake, a wetland habitat, are the only unique habitats directly adjacent to T/E routes. Over 50 unique habitats have been identified in the ROI and several of these are within the deployment area. Giant Springs is a highly regulated state park and fish hatchery on the Missouri River at Great Falls, and is considered one of the largest multiple springs in the world. Crown Butte is a Nature Conservancy preserve that occurs within several miles of the T/E routes. It is dedicated to the protection of native prairie grasslands. Willow Creek, Pishkun, and Benton Lake national wildlife refuges are near T/E routes (three other refuges occur in the ROI). These refuges primarily serve as waterfowl production areas. The USFWS also maintains a number of easements for waterfowl production throughout the deployment area. Lake Frances, a state-managed lake, is also an important waterfowl resource in the deployment area. The Missouri and Smith rivers in Cascade County are considered high-value use areas for white-tailed and mule deer, otters, antelope, and other species. In general, natural resource management agencies recognize stream riparian zones and wetlands as unique habitats in the ROI. A number of small unique habitats, including Research Natural Areas, remnant prairie stands, and Nature Conservancy easements, occur throughout the ROI. The more notable unique habitats in the ROI include the Great Bear, Bob Marshall, and Scapegoat wildernesses in the Lewis and Clark National Forest; Glacier National Park; and Charles M. Russell National Wildlife Refuge.

The majority of the unique and sensitive habitats in the ROI are managed by public or private agencies for the protection of the habitat. Little growth and development is expected in these areas; therefore, additional unmanageable pressure should not occur on these habitats. In addition, conditions will not change significantly in these habitats in the future. This trend of minor or no change is expected to extend to unmanaged areas as well, though the future status of habitats on private lands cannot be accurately predicted.

3.8.3.5 Threatened and Endangered Species

Plants. No federally listed threatened or endangered plant species are known to occur in the deployment area or elsewhere in the ROI. One Category 2 candidate species, persistentsepal yellowcress, occurred historically near the Sun River and Benton Lake area (Figure 3.8.3-7), and its habitat may be encountered in the areas of direct surface disturbance. The plant grows on shores and pond margins and is also reported from locations along the Yellowstone River, southeast of the deployment area. (Scientific names and the federal and state status of plant species discussed in this section are listed in Table 3.8.3-3. Federal and state categories are further defined in Section 3.8.2.6, and Tables 3.8.2-1 and 3.8.2-2.)



Sources: USFWS 1980c, 1982; Montana Department of Fish, Wildlife and Parks 1984b; Montana Bald Eagle Working Group 1986; Montana Natural Heritage Program 1986; Flath 1986.

FIGURE 3.8.3-7 APPROXIMATE LOCATIONS OF THREATENED AND ENDANGERED SPECIES IN THE DEPLOYMENT AREA

Table 3.8.3-3

Federal-Candidate and Montana-Recognized Plant Species Occurring or Potentially Occurring in the Deployment Area and Region of Influence

Common Name[1]	Scientific Name[1]	Federal Status[2]	MNHP/State Status[3]
Deployment Area			
Chaffweed	Centunculus minimus	-	S1
Craw's sedge	Carex crawei	-	S1
Dwarf wooly-heads	Psilocarphus brevissimus var. brevissimus	-	S1
Foxtail muhly	Muhlenbergia andina	-	S2
Graceful arrowgrass	Triglochin concinnum var. debile	-	S2
Guadalupe water-nymph	Najas guadalupensis	-	S1
Klaus bladderpod	Lesquerella klausii	-	S1
Long-styled thistle	Cirsium longistylum	-	S2Q
Many-headed sedge	Carex sychnocephala	-	S1
Pale sedge	Carex livida	-	S1
Persistentsepal yellowcress	Rorippa calycina	Cat. 2	S2
Subterranean breadroot	Psoralea hypogaea	-	S1
Tapered rush	Juncus acuminatus	-	S1
Region of Influence Exclusive of Deployment Area			
Aromatic everlasting	Antennaria aromatica	Cat. 2	S2
Bird's egg lady's slipper	Cypripedium passerinum	-	S1
Curved sedge	Carex incurviformis var. danaensis	-	S1
Cushion townsendia	Townsendia condensata	-	S1
Dwarf sawwort	Saussurea nuda var. densa	-	S1
Fan-leaved daisy	Erigeron flabellifolius	-	S2

Table 3.8.3-3 Continued, Page 2 of 2

Common Name[1]	Scientific Name[1]	Federal Status[2]	MNHP/State Status[3]
Goose-grass sedge	Carex lenticularis var. dolia	Cat. 2	S1
Heart-leaved buttercup	Ranunculus cardiophyllus	-	S1
Howell's gum-weed	Grindelia howellii	Cat. 2	S3
Klaus' fleabane	Erigeron lackschewitzii	-	S1Q
Leadville milk-vetch	Astragalus molybdenus	-	S1
Missoula phlox	Phlox missoulensis	-	S2Q
Montana cryptantha	Cryptantha sobolifera	-	S1
Mountain moonwort	Botrychium montanum	-	S2
Mountain twinpod	Physaria saximontana var. dentata	-	S1
Northern eyebright	Euphrasia disjuncta	-	S1
Park milk-vetch	Astragalus leptaleus	-	SUS1
Peculiar moonwort	Botrychium paradoxum	Cat.2	S1
Round-leaved orchis	Orchis rotundifolia	-	S1
Running fleabane	Erigeron flagellaris	-	S1
Showy pussy-toes	Antennaria pulcherrima	-	S1
Stalked-pod crazyweed	Oxytropis podocarpa	-	S1
Timber milk-vetch	Astragalus convallarius	-	S1
Water clubrush	Scirpus subterminalis	-	S1
Wavy moonwort	Botrychium crenulatum	Cat. 2	S1
White glacierlily	Erythronium grandiflorum ssp. candidum	-	S2
Wooly daisy	Erigeron lanatus	-	S2

Notes: [1]Nomenclature follows MNHP 1986 and Lesica et al. 1984.
[2]See Table 3.8.2-1.
[3]See Table 3.8.2-2.

Source: MNHP 1986.

Twelve plant species listed by the MNHP as species of special concern (Montana-recognized) and ranked on the basis of their rangewide/global rarity or rarity within the state, occur or may occur within the deployment area. Long-styled thistle is known to occur in the area of direct surface disturbance near Monarch and is considered by the MNHP to be imperiled. One species, subterranean breadroot, is known historically from the Great Falls area; however, more definitive information on the location of the original sighting is not available and road upgrading is expected to be limited in the general areas. Consequently, the species was dropped from consideration for field survey. Ten other Montana-recognized species are known to occur in or near the deployment area and grow in habitats that may occur in the area of direct surface disturbance. Nine of these species occupy aquatic or moist to semimoist habitats. Craw's sedge, pale sedge, and tapered rush occur in the Pine Butte area west of Choteau; many-headed sedge, foxtail muhly, Guadalupe water-nymph, and dwarf wooly-heads occurred historically in the Sand Coulee area southeast of Great Falls; chaffweed is reported from Box Elder Creek and the Great Falls area; and graceful arrowgrass is reported from a site near Pishkun Reservoir in Teton County. Klaus bladderpod occurs just outside the deployment area southwest of Bowmans Corners. Potential habitat may occur in the areas of direct surface disturbance.

Five Category 2 candidate plants (aromatic everlasting, wavy moonwort, peculiar moonwort, goose-grass sedge, and Howell's gum-weed) occur or are likely to occur elsewhere in the ROI. All of these species are considered to be species of special concern by the MNHP. In addition, 22 Montana-recognized species may also occur in the indirect impact area (Table 3.8.3-3).

Animals. The American peregrine falcon is known to occur within the deployment area, where it is primarily associated with lakes, rivers, and marshes (scientific names are given in Table 3.8.3-4). Peregrines are also known to overwinter in the state; however, the exact locations are not known. Aeries are believed to occur within Lewis and Clark, Cascade, and Chouteau counties, and nesting activities may also occur in other areas within the deployment area. In addition, approximately 60 known bald eagle breeding pairs occur in Montana, with several nesting sites occurring in or near the deployment area. Approximately 450 to 500 eagles overwinter in Montana with many concentrated along the Missouri River. A raptor staging area for spring migration also occurs within the deployment area along the Missouri River southwest of Great Falls (Figure 3.8.3-7). This area is utilized by bald eagles.

Other wildlife species listed as threatened or endangered that may occur within the deployment area include the grizzly bear, gray wolf, and black-footed ferret. Primary grizzly bear habitat is located outside the deployment area along the Rocky Mountain Front Range; however, grizzly bears are known to occur within the western region of the deployment area (Figure 3.8.3-7). The wolf may occur in the same general forest habitat as the grizzly; however, the wolf population is currently at a very low level and wolves are probably very rare in the deployment area. No known populations of black-footed ferrets occur in Montana. However, wildlife officials view Montana as having the potential for containing isolated black-footed ferret populations. If black-footed ferrets do occur within the deployment area, they will be found in association with prairie-dog towns in the eastern portion of the area.

In addition to the federally listed species previously discussed, several federal-candidate species are known to occur in the deployment area (Table 3.8.3-4). Mammalian candidate species inhabiting the deployment area include the northern swift fox and spotted bat, which inhabit grassland and rocky outcroppings, respectively. Preble's shrew may also

Table 3.8.3-4

Federally Listed, Federal-Candidate, and Montana-Recognized Animal Species Occurring in the Deployment Area and Region of Influence

Common Name	Scientific Name	Federal Status[1]	State Status[2]
Deployment Area			
American peregrine falcon	Falco peregrinus anatum	E	S1
Bald eagle	Haliaeetus leucocephalus	E	S2
Black-footed ferret	Mustela nigripes	E	SH
Canadian toad	Bufo hemiophrys	-	S1
Ferruginous hawk	Buteo regalis	Cat. 2	S3
Gray wolf	Canis lupus	E	S1
Grizzly bear	Ursus arctos	T	S3
Harlequin duck	Histrionicus histrionicus	-	S2
Long-billed curlew	Numenius americanus	Cat. 2	S4
Lynx	Felis lynx	Cat. 2	S4
Milk snake	Lampropeltis triangulum	-	S1
Mountain plover	Charadrius montanus	Cat. 2	S2
Northern swift fox	Vulpes velox	Cat. 2	S1
Preble's shrew	Sorex preblei	Cat. 2	S3
Sage sparrow	Amphispiza belli	-	S2
Spotted bat	Euderma maculatum	Cat. 2	S1
Upland sandpiper	Bartramia longicauda	-	SU
Wolverine	Gulo gulo	Cat. 2	S4
Region of Influence Exclusive of Deployment Area			
Alexander's rhyacophilan caddisfly	Rhyacophila alexanderi	Cat 2	S1
Arctic peregrine falcon	Falco peregrinus tundrius	T	S1
California bat	Myotis californicus	-	S2
Dickcissel	Spiza americana	-	S1
Fringed bat	Myotis thysanodes	-	S2
LeConte's sparrow	Ammodramus leconteii	-	S1
Meltwater lednian stonefly	Lednian tumana	Cat. 2	S1
Montana Arctic grayling	Thymallus arcticus montanus	Cat. 2	S2
Northern bog lemming	Synaptomys borealis sphagnicola	Cat. 2	S1
Paddlefish	Polydon spathula	Cat. 3C	S2
Pallid sturgeon	Scaphirhynchus albus	Cat. 2	S2
Spoonhead sculpin	Cottus ricei	-	S1
Trout-perch	Percopis omniscomaycus	-	S1
Whooping crane	Grus americana	E	SH

Notes: [1]See Table 3.8.2-1.
[2]See Table 3.8.2-2.

occur in the deployment area and is associated with moist meadows, forests, and marshes. Other candidate species include the ferruginous hawk, long-billed curlew, mountain plover, wolverine, and lynx. Ferruginous hawks inhabit grassland and unbroken terrain throughout the deployment area. The mountain plover also occurs in areas of direct surface disturbance where it is primarily associated with grassland areas (Figure 3.8.3-7). The long-billed curlew also occurs primarily in grassland areas in the region; however, it also frequents wetland areas such as marshes, mudflats, and shorelines during winter and migration. The wolverine and lynx occur in mountainous habitats.

Several Montana-recognized species also occur in various habitats found in the deployment area (Table 3.8.3-4). In addition to those species known to occur in the deployment area, several additional species may occur in the ROI and along the periphery of the deployment area. These federally listed, federal-candidate, and Montana-recognized animal species are also listed in Table 3.8.3-4.

3.9 Water Resources

The construction and operations of the proposed Small Intercontinental Ballistic Missile (ICBM) system would require substantial amounts of water. The integrated diversion, use, and return of the water resources are of primary concern to local users and to state and federal regulatory agencies. Additionally, the amount and type of water use has a direct effect upon the surface and groundwater resource base. Therefore, the evaluation of water resources is divided into three elements: surface water hydrology and quality, groundwater hydrology and quality, and water use.

3.9.1 Resource Description

This site-specific analysis includes a more detailed consideration of water use than was provided in the Legislative Environmental Impact Statement (LEIS). For the LEIS, major diversions and other uses of surface and groundwater were integrated with the discussions of these resources. The LEIS analysis suggested that for the site-specific document it was appropriate to consider water use separately from surface water and groundwater features. In addition, for the site-specific Environmental Impact Statement (EIS), local features of water resources were analyzed in greater detail.

3.9.1.1 Surface Water Hydrology and Quality

The surface water hydrology and quality element addresses the effects of the proposed program on the regional water quality and flow characteristics of the major streams, lakes, and reservoirs within the study area. This assessment considers seasonal variations in flow, flood potential, state-designated water uses, and applicable water quality standards. Emphasis is placed upon the streams most likely to be affected by the proposed program.

3.9.1.2 Groundwater Hydrology and Quality

The groundwater hydrology and quality element addresses the effects of the proposed program on groundwater reserves, well yields, water table fluctuations, and water quality characteristics of the principal groundwater aquifers of the study area. This element considers the interaction of ground and surface waters, particularly the phenomenon of saline seep, a problem that may be intensified by the proposed program. Recharge to and withdrawal from the aquifers are considered in both a local and regional context.

3.9.1.3 Water Use

Water use is considered a separate element in this analysis. This element addresses the amount and type of water use (including program water) that is diverted from the natural resource base. The adequacy of the regional supply sources to meet baseline and program-induced water demands is determined. Other issues addressed in this element include changing trends in water use, existing or projected water shortages, and the legal and institutional aspects of water use.

3.9.2 General Analysis Methodology

3.9.2.1 Region of Influence

The following considerations were used to define the Region of Influence (ROI) for water resources: the surface water basins and groundwater aquifers that provide water supplies

for program-induced water requirements; areas of program-induced alteration to surface water drainage and storage features; and areas of program-induced water quality impacts. The ROI is located in north-central Montana. It includes a stretch of the Missouri River from Holter Dam to just upstream of Fort Peck Lake. The ROI begins just to the east of the Continental Divide and is bounded on the north by the Marias and Missouri rivers, on the east by the meridian passing through the Town of Roundup, and on the south by the Belt Mountains and by the Musselshell drainage (Section 3.9.3, Figure 3.9.3-1). The ROI has an areal extent of approximately 18,300 square miles (sq mi) and contains the major support community of Great Falls. This ROI is somewhat smaller than that defined in the LEIS. The analysis performed during the LEIS showed that program impacts to water resources will occur only to the smaller area.

3.9.2.2 Surface Water Hydrology and Quality

U.S. Geological Survey (USGS) and Montana Department of Natural Resources and Conservation (MDNRC) records were used to identify the important streams, lakes, and reservoirs in the ROI. The average magnitude and range of streamflow values and selected water quality parameter values (temperature, dissolved oxygen, pH, nutrients, and others as appropriate) were calculated for selected locations using data available on water data storage and retrieval system (WATSTORE) and storage and retrieval system (STORET) national water data bases. The STANDARDS program available on STORET and water quality criteria adopted by the Montana Water Quality Bureau (MWQB) were used to calculate a summary of the frequency of violations of appropriate water quality standards. Particular emphasis was placed on determining turbidity and suspended solids levels in ROI streams because these levels have the potential to increase during the construction phase as a result of land disturbance. The issues of sedimentation and soil erosion are also discussed in Biological Resources and Threatened and Endangered Species (Section 3.8) and Geology and Soils (Section 3.10).

Maps showing streams, canals, major lakes and reservoirs, drainage basin boundaries, and the location of gaging and water quality stations were prepared. The locations of major diversions were also plotted. Recent trends in the flow and quality of major streams were determined from available literature. The water quality effects of the wastewater discharges of the three towns potentially affected by the program (Great Falls, Conrad, and Lewistown) were determined from discharge information and agency interviews. Planned water resource programs in the ROI were identified from interviews with water agencies.

Existing flood hazards and floodplain delineations were evaluated using U.S. Army Corps of Engineers (COE) and U.S. Soil Conservation Service (SCS) floodplain information reports and from flood-insurance maps. Data on past major flood events were reviewed, particularly those resulting in urban damages. Existing major flood control structures and planned system improvements were incorporated in the analysis.

3.9.2.3 Groundwater Hydrology and Quality

The major groundwater aquifers in the ROI were identified based on size and regional importance. A map showing the principal groundwater aquifers in the ROI was developed in cooperation with the Montana Bureau of Mines and Geology (MBMG). Data characterizing the major aquifers were summarized, including well yields, depth to groundwater, areas of historical groundwater declines, and other pertinent data. As existing data permitted, information on recharge and discharge areas, pumpage, and specific capacity of wells in the principal aquifers was developed. The regional interaction between surface

water and groundwater was reviewed and information on major springs was summarized. Current evidence of saline seep in the vicinity of existing Air Force facilities was determined using aerial photographs.

Groundwater quality trends were determined with an emphasis on the concentrations of total dissolved solids (TDS), a criterion of particular concern in groundwater supply. Violations of State water quality standards and/or National Primary Drinking Water Criteria developed by the Environmental Protection Agency (EPA) (in the case of potable water wells) were noted. Groundwater sources known or suspected by federal or state authorities to be contaminated by hazardous wastes were also identified.

3.9.2.4 Water Use

Five categories of regional water use were analyzed: (1) military water use, (2) self-supplied industrial water use (including power generation), (3) municipal water supply, (4) water use for agricultural irrigation, and (5) rural water use (rural domestic and livestock use). With regard to municipal water supply, only the sources of municipal water are analyzed in this section. Municipal water treatment, storage, and delivery are treated under the utilities analysis in Section 3.2.3.1. Water use data for Malmstrom Air Force Base (AFB), Great Falls, and towns with a potential to experience a substantial, program-induced population increase (Conrad and Lewistown) were compiled and per capita and related water use factors were developed, taking into account recent trends. Instream flow requirements for hydroelectric generation, recreation, and habitat maintenance were also reviewed. Agricultural irrigation, which is the dominant category of water use in the ROI, was quantified by irrigation district for individual stream basins.

The adequacy of the regional supply sources to meet the baseline water demands was evaluated. Specific evaluations were also made of the adequacy of existing water sources in the potentially affected towns. Areas with existing or projected water shortages were determined from both literature and interviews with water resource agencies. Basic legal constraints controlling water use (e.g., Montana water law, local water management policies, and interstate compacts) were reviewed.

3.9.3 Existing and Future Baseline Conditions

Most of the ROI has a semiarid climate that generates little runoff. Surface water supplies are of large quantity and good quality in the mountains, but variable in both quantity and quality in the Plains. Great Falls, which supplies Malmstrom AFB, receives an ample supply from the Missouri River and does not anticipate any problems in meeting its future water requirements. The groundwater resource is also generous, though much of the water lies at considerable depth and is highly mineralized. The 1980 total water use in the ROI was 1.9 million acre feet per year (acre-ft/yr); the main consumptive use was irrigation. The only sizable water development project likely to occur in the ROI is a diversion from the Missouri River into the Milk River drainage to be constructed after the year 2000.

3.9.3.1 Surface Water Hydrology and Quality

Since the ROI has a semiarid climate that generates little runoff, the majority of the streamflow originates in the mountainous region around the Continental Divide. Surface water supplies are generally of good quality in all mountainous areas. The principal hydrologic feature in the ROI is the Missouri River, which originates at the confluence of the Madison, Jefferson, and Gallatin rivers in southwestern Montana. The Missouri River

flows in a northerly direction for 85 miles before entering the ROI at Holter Dam. The river then flows northerly and easterly through the ROI for 250 miles. Shortly after entering the ROI, the Missouri River leaves the Rocky Mountains and flows into the Northern Great Plains. As it flows, it picks up large quantities of sediment from the Plains. The river's quality is further degraded as a result of discharges of municipal and industrial wastes and extensive agricultural activities. Because of these factors, water quality decreases in a downstream direction and the river changes from a salmonid fishery above Great Falls to a warmwater fishery just downstream of Great Falls below Rainbow Dam. A 150-mile segment of the Missouri River is classified as wild and scenic from Fort Benton downstream almost to Fork Peck Lake.

Other major streams in the ROI are the Dearborn, Smith, Sun, Marias, Teton, Judith, and Musselshell rivers and the Belt, Arrow, and Flatwillow creeks (Figure 3.9.3-1). Like the Missouri River, they originate in the mountains and tend to undergo considerable water quality degradation as they flow toward the Missouri River. Agricultural diversions greatly deplete the flow of several of these rivers. Tables 3.9.3-1 and 3.9.3-2 summarize data on these streams.

The three largest reservoirs in north-central Montana are Fort Peck Lake, Canyon Ferry Lake, and Lake Elwell (Figure 3.9.3-1). Because of the lack of local participation, the irrigation supply provided by Lake Elwell has been only partially used. Lake Elwell and Canyon Ferry reservoirs may have water available for additional downstream uses. Table 3.9.3-3 describes other lakes and reservoirs in the ROI.

Historically, the most flood-prone stream in the ROI is the Sun River. Since 1908, the Sun River has been above flood stage at Great Falls 17 times. The most serious flooding occurred in June 1975 when damages were estimated to be in excess of $9.4 million. A flood protection levee was constructed in 1986 on the north bank near the mouth of the Sun River. This levee will prevent a great majority of the damages that have formerly occurred from Sun River flooding in the western portion of Great Falls. A smaller flood control project on the Sun River is located at Vaughn, where the river is joined by Muddy Creek. The project consists of channel relocation and improvement on Muddy Creek, and construction of 12,570 feet of levee and appurtenant structures on both the Sun River and Muddy Creek. Spring runoff which results in urban flooding is also a problem in the Town of Roundup located on the Musselshell River. Rural flooding is common along the Judith, Musselshell, Sun, and upper Marias rivers.

There are no major problems associated with the storm-drainage systems of Great Falls, Lewistown, and Conrad. These entities have a few, highly localized areas that drain slowly and may flood during high-intensity storms; however, their respective public works departments generally have long-term programs to implement corrective measures. An exception is Gibson Flats, a rural-residential area located just south of Great Falls in the 100-year floodplain of Sand Coulee Creek. This low, poorly drained area receives runoff from the city and may be sensitive to new developments occurring in the southern portion of Great Falls that induce additional runoff to the area. Malmstrom AFB drains north, directly to the Missouri River, via several coulees. Although the base has no major drainage problems, onbase-generated runoff has caused substantial erosion in some of these coulees.

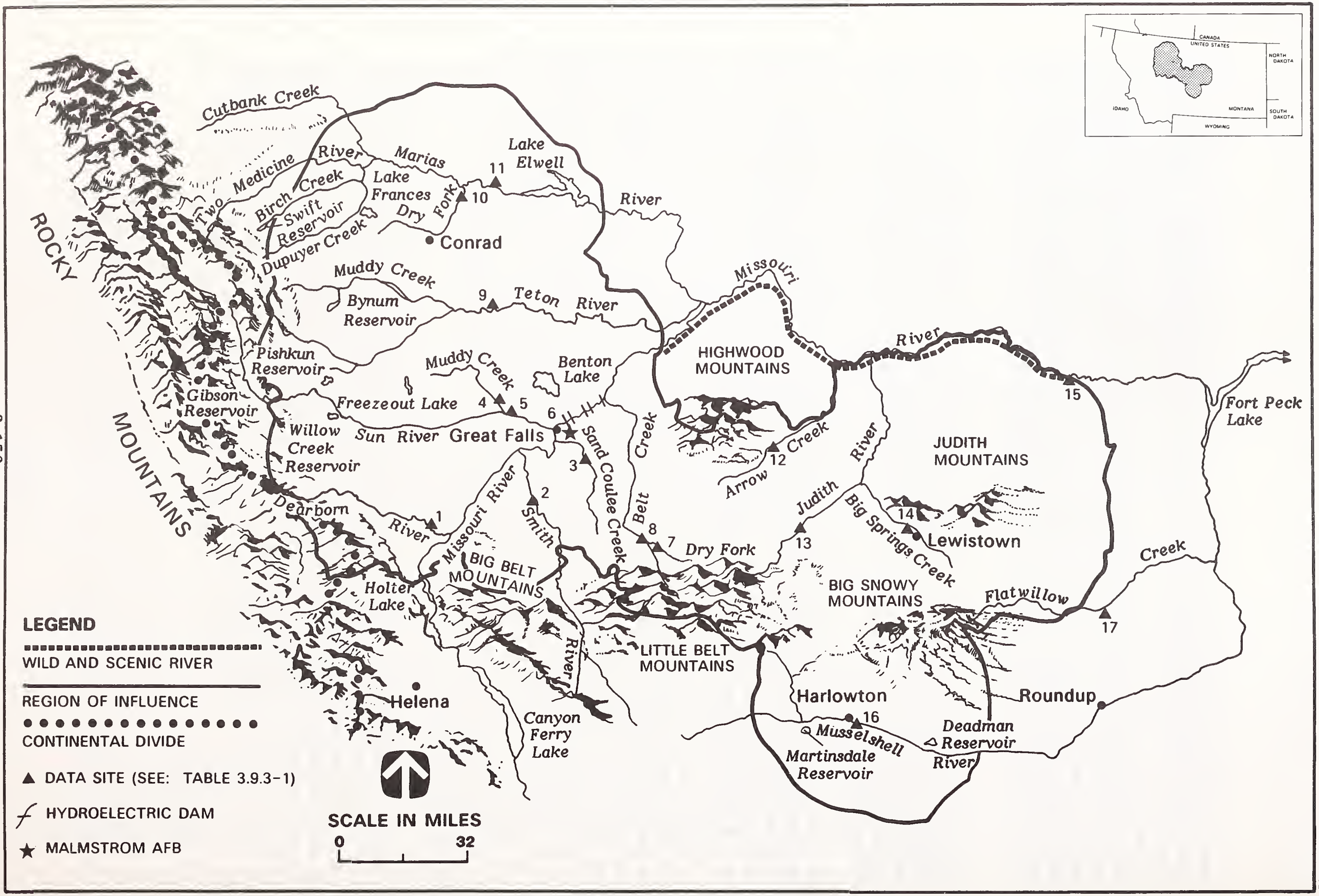


FIGURE 3.9.3-1 SURFACE WATER FEATURES IN THE REGION OF INFLUENCE

Table 3.9.3-1

Selected Hydrologic Data for Major Streams in the Region of Influence

Gaging Station				Streamflow Characteristics			
Site No.[1]	Stream Name	Drainage Area (sq mi)	Years of Record	Estimated 7-Day 10-Year Low Flow (cfs)[2]	Average Annual Flow (cfs)	Average Annual Flow [acre-ft/yr]	Estimated 100-Year Flood (cfs)
1.	Dearborn River	325	25	18	218	[158,000]	18,000
2.	Smith River	1,594	15	15	338	[245,000]	12,700
3.	Sand Coulee Creek	118	0	N/A[3]	N/A		N/A
4.	Muddy Creek	314	18	11	128	[93,000]	6,500
5.	Sun River	1,854	52	79	718	[520,000]	69,800
6.	Missouri River	23,292	30	3,777	8,087	[5,955,000]	81,300
7.	Dry Fork-Belt Creek	62	0	N/A	N/A		N/A
8.	Belt Creek	368	31	6	192	[139,000]	11,400
9.	Teton River	1,307	32	13	157	[114,000]	27,300
10.	Dry Fork-Marias River	314	3	N/A	26	[8,800]	3,706
11.	Marias River	3,242	78	65	933	[675,000]	76,000
12.	Arrow Creek	1,211	0	N/A	N/A		N/A
13.	Judith River	328	55	0.3	55	[40,000]	1,700
14.	Big Springs Creek	140	24	83	107	[77,500]	219
15.	Missouri River	40,987	52	2,785	9,455	[6,845,000]	144,400
16.	Musselshell River	1,125	76	65	166	[120,000]	5,800
17.	Flatwillow Creek	188	44	0.7	28	[20,600]	N/A

Notes:
[1]See Figure 3.9.3-1 for location of sites.
[2]Cubic feet per second.
[3]N/A = data not available.

Source: USGS 1987.

Table 3.9.3-2

Selected Water Quality Data for Major Streams in the Region of Influence

Site No.[1]	Stream Name	Water Quality Parameters (Average of All Observations Values): TDS (mg/l)[2]	Suspended Solids (mg/l)	Turbidity (JTU)[3]	pH (S.U.)[4]	DO (mg/l)	Total Phosphorus (mg/l)	Nitrates N (mg/l)	Fecal Coliforms (MPN/100 ml)[5]
1.	Dearborn River	N/A[6]	N/A	0.5	N/A	N/A	0.01	0.3	N/A
2.	Smith River	N/A	N/A	1.5	N/A	9.6	N/A	N/A	12
3.	Sand Coulee Creek	N/A	N/A	3.5	N/A	N/A	N/A	N/A	N/A
4.	Muddy Creek	669	4,940	85	8.1	7.2	0.28	3.24	N/A
5.	Sun River	500	53	25	8.3	10.4	0.04	0.84	10
6.	Missouri River	250	26	8	8.2	8.0	0.06	0.11	N/A
7.	Dry Fork-Belt Creek	N/A	10	8	7.7	N/A	0.01	N/A	N/A
8.	Belt Creek	N/A	7	4	7.6	9.5	N/A	N/A	7
9.	Teton River	N/A	N/A	5	8.4	10.0	0.13	0.4	19
10.	Dry Fork-Marias River	N/A	N/A	N/A	7.0	10.0	N/A	N/A	200
11.	Marias River	387	N/A	N/A	N/A	N/A	0.22	0.4	N/A
12.	Arrow Creek	N/A	57	8	8.2	N/A	0.05	1.0	N/A
13.	Judith River	N/A	N/A	0.6	8.4	N/A	0.01	0.04	N/A
14.	Big Springs Creek	N/A	7	3.4	8.0	N/A	0.08	0.34	50
15.	Missouri River	308	208	167	8.4	8.9	0.11	0.15	N/A
16.	Musselshell River	1,675	30	11	8.5	9.9	0.07	0.11	170
17.	Flatwillow Creek	N/A	471	13	N/A	N/A	N/A	N/A	N/A

Notes: [1]See Figure 3.9.3-1 for locations of sites.
[2]mg/l = milligrams per liter.
[3]JTU = Jackson Turbidity Unit.
[4]S.U. = Standard Units.
[5]MPN = Most Probable Number
[6]N/A Data not available or unreliable.

Source: U.S. EPA 1987.

Table 3.9.3-3

Major Lakes and Reservoirs in the Region of Influence

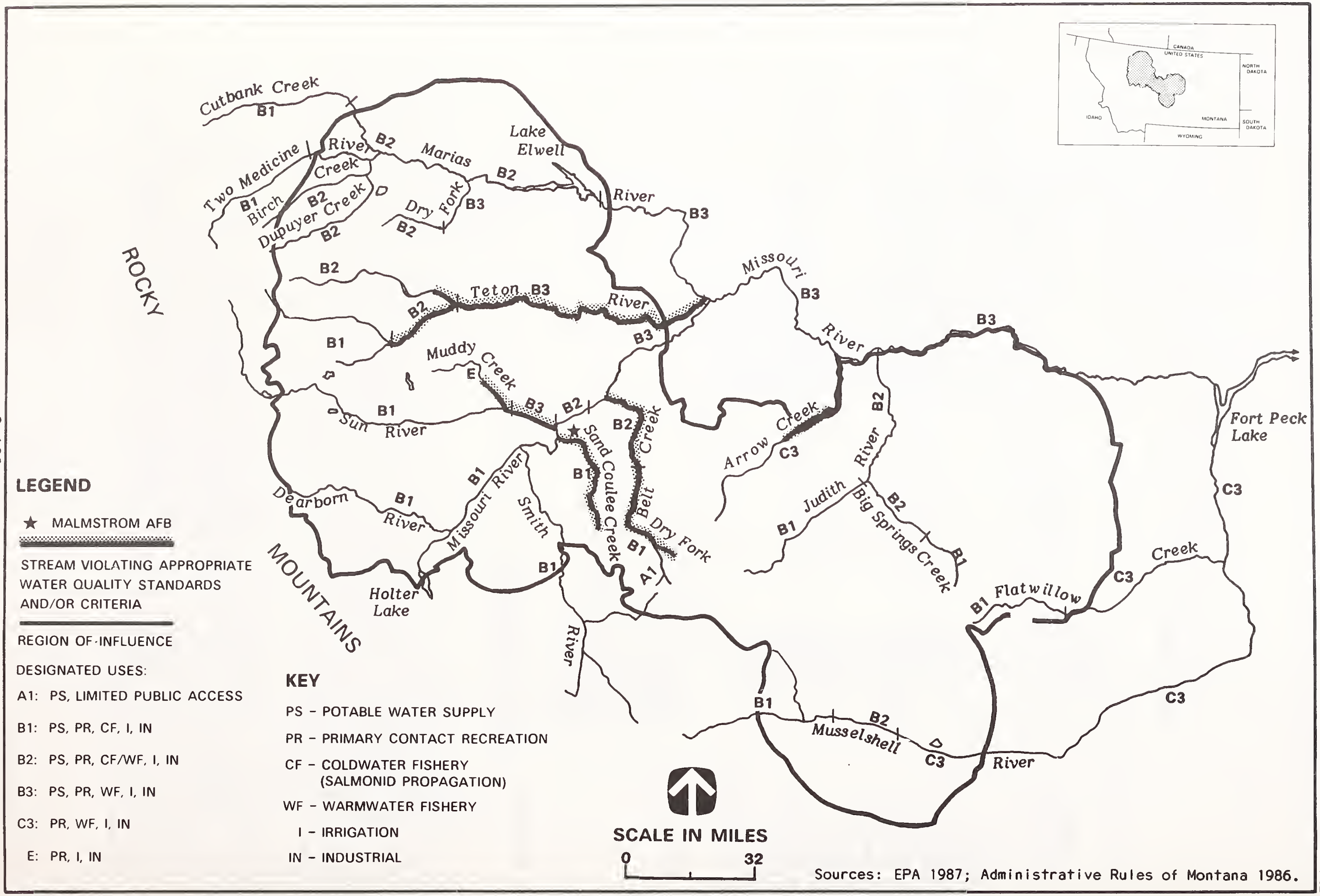
Lake or Reservoir	Usable Capacity (acre-ft)	Principal Uses[1]	River Basin
Benton	Minor	W, R	Missouri River, Great Falls Reach
Bynum	87,500	I	Teton River
Canyon Ferry	2,043,000	H, F, R, I	Missouri River, Canyon Ferry Reach
Deadman	72,200	I	Upper Musselshell River
Elwell	1,347,000	F, I, R	Marias River
Fort Peck	18,910,000	H, F, R	Missouri River, Fort Peck Reach
Frances	111,900	S, I, R	Marias River
Freezeout	Minor	W, R	Teton River
Gibson	99,100	I, W, R	Sun River
Holter	81,900	H, F, R	Missouri River, Canyon Ferry Reach
Martinsdale	23,100	I	Upper Musselshell River
Pishkun	32,400	W, R	Sun River
Swift	31,000	I	Birch Creek
Willow Creek	32,200	W, R	Sun River

Note: [1]I = Agricultural irrigation.
W = Wildlife refuge.
F = Flood control.
H = Hydroelectric power generation.
R = Recreation.
S = Public supply.

Sources: Montana Department of Natural Resources and Conservation 1977; U.S. Army COE 1986b.

The predominant chemical character of surface water in the ROI is calcium-bicarbonate (hard) water, with a relatively low sediment content and a low concentration of dissolved solids (50-500 milligrams per liter [mg/l]). Exceptions are the Missouri River downstream of its confluence with the Marias River and the middle and lower reaches of the Teton and the Musselshell rivers. These segments have a sodium sulfate type of water and high concentrations of dissolved solids of up to 2,000 mg/l in the Teton and Musselshell rivers. For comparison, the EPA Secondary Drinking Water Standard is 500 mg/l.

Generally, water quality in the ROI is good and the State of Montana has classified most river segments as suitable for municipal supply. However, several significant problems exist. Natural sediments and salinity amplified by agricultural practices and irrigation returns are the main causes of surface water quality degradation. Figure 3.9.3-2 describes the state-designated uses of the major streams in the ROI, emphasizing those stream segments that fail to meet their appropriate water quality standards. These segments have been identified from the limited number of recent water quality analyses available through the STORET data base.



EM3-WR/3

FIGURE 3.9.3-2 DESIGNATED USES OF THE MAJOR STREAMS IN THE REGION OF INFLUENCE

Sediments in Muddy Creek are causing a major problem in the lower reach of the Sun River, which receives an average of 213,000 tons of soil per year. The MWQB has classified the situation as one of Montana's principal water quality problems. Major factors that led to the classification are unstable soils in the lower 10 miles of the Muddy Creek channel and abnormally high flows caused by excess return flow from the Greenfields Irrigation Project. Just south of Great Falls, Sand Coulee Creek and several of its tributaries experience severe pollution caused by acid drainage from abandoned underground coal mines. Groundwater infiltrates through the overlying Kootenai Formation into the Morrison coal bed, oxidizing pyrite within the abandoned mines and discharging at low pH (2.3-5.0). Water quality data collected from springs in the Sand Coulee Creek drainage indicate high levels of heavy metals that exceed secondary drinking water standards. The same problem is also present, to a lesser degree, in the drainage of nearby Belt Creek. Heavy metal concentrations on Belt Creek near Monarch are high. Carpenter Creek, site of the Montana Mining District, drains into this segment of the creek and is the probable metals source. The Dry Fork-Belt Creek, which joins Belt Creek at Monarch, has also been severely degraded by acid mine drainage from the Hughesville-Barker area.

Depletion of surface waters, resulting from irrigation withdrawals, occurs regularly on tributaries and along the main stems of the Sun, Marias, Teton, and Musselshell rivers. This depletion, superimposed on natural drought cycles, results in the dewatering of the smaller tributaries. The Musselshell River has historically been known for its very low flows, with its middle reach sometimes going dry in the late summer. The Teton River is periodically dry in its middle reach. The combination of water withdrawals and increased sedimentation resulting from stream channelization has significantly decreased the water quality in the Teton River near Choteau. In addition, saline discharges from Freezeout Lake have impaired irrigation uses in the lower reaches of the river.

Wastewater generated at Malmstrom AFB is collected and treated by the Great Falls wastewater treatment system and discharged to the Missouri River. Great Falls discharged 10,500 acre-ft in 1986, which includes 725 acre-ft generated at Malmstrom AFB. Lewistown discharged 2,800 acre-ft of effluent to Big Springs Creek in 1986. Conrad discharged 480 acre-ft of effluent to Dry Fork-Marias River via the Little Dry Coulee during the same period. State effluent discharge requirements for the three wastewater treatment systems have generally been met and no major water quality problems are currently reported. Further information on the wastewater systems of these towns can be found in Section 3.2, Utilities.

Only one major surface water development project in the ROI is being considered during the projected period. The Bureau of Reclamation is currently quantifying water shortages in the Milk River Basin and considering a water diversion from the northernmost bend of the Missouri River to the Big Sandy Creek in the Milk River drainage. The amount of water to be diverted would be from 150,000 to 500,000 acre-ft/yr. If approved, this diversion would begin after the year 2000. During droughts, irrigators diverting water from the downstream reaches of many rivers experience severe and unpredictable shortages late in the season. These shortages also make it difficult to maintain minimum streamflows for the state's sport fisheries. Remedies that are being considered by state and local officials include the construction of additional storage reservoirs; conjunctive use, such as low-flow augmentation with groundwater; and the transfer of subsurface water between river basins. Such practices may increase minimum streamflows in the future.

The Montana Department of Fish, Wildlife and Parks is currently analyzing many of the streams in the Missouri River drainage to determine the minimum flow requirements necessary to maintain an adequate fisheries habitat. During 1987, the department is expected to initiate proceedings to reserve minimum flows in dozens of such streams, primarily in or near the mountainous areas of the ROI. If the proceedings are successful, many of the streams in the ROI will be assured of reasonably stable base flows in the future. In addition, the Bureau of Land Management is currently negotiating with the state for a minimum flow reservation through the wild and scenic segment of the Missouri River, downstream of Fort Benton.

3.9.3.2 Groundwater Hydrology and Quality

Groundwater is highly variable throughout the ROI in terms of both quality and quantity. Three of the largest springs in the United States lie within the ROI. However, in portions of the ROI, rural water users must haul water long distances due to low well yields and poor groundwater quality. There has been comparatively little groundwater development in the ROI. However, groundwater is the source of water for approximately 90 percent of the communities in the Great Plains of Montana with municipal water supply systems. Major groundwater aquifers in the ROI include (in stratigraphic order) alluvial and bench deposits, glacial deposits, the Judith River and Two Medicine formations, the Eagle/Virgelle Formation, the Kootenai Formation, and the Madison Aquifer. Several of the deep aquifers underlie most of the ROI but their depth has prevented groundwater development. The TDS concentrations in the deeper aquifers are usually at a minimum near the areas of recharge in the mountains and along the major rivers. Groundwater quality tends to deteriorate away from the mountains, and as one moves east through the ROI, TDS concentrations frequently exceed 2,000 mg/l, rendering the groundwater non-potable. Characteristics of the principal aquifers in the ROI are shown in Table 3.9.3-4. The aquifers supplying the majority of the groundwater in the ROI (e.g., the principal aquifer) are shown in Figure 3.9.3-3.

The most heavily used groundwater sources in the ROI are unconsolidated alluvium and terrace deposits of Quaternary age such as those adjacent to the Missouri River and the lower reach of the Sun River. Although areally limited, these aquifers are an important water source for the rural population and are mainly used for domestic and livestock consumption. The water from unconsolidated deposits is generally of good quality but locally may be high in mineral content. The chemical character of the water is as variable as the deposits themselves. However, the predominant water type is a calcium-bicarbonate (hard). The TDS concentration from alluvial water averages around 500 mg/l, but it can range up to 2,500 mg/l, making it unsuitable for domestic use. As a result, rural landowners in some areas, particularly the northwestern portion of the ROI, must haul potable water long distances from municipal sources. Some wells tapping alluvium and terrace deposits occasionally exceed primary drinking water standards with marginal concentrations of lead, selenium, cadmium, nitrate, fluoride, and arsenic. For example, wells tapping the alluvium of the preglacial Missouri River, now occupied by Sand Coulee Creek, are subject to contamination from acid mine drainage (from upgradient abandoned coal mines) which has caused the abandonment of most domestic wells in the area.

Data for recharge values for individual aquifers, with the exception of the Madison Aquifer, are not available. However, the USGS has estimated that the groundwater system in Montana receives yearly recharges ranging from 1 inch in the Great Plains area up to several inches in the mountain ranges. Most recharge is thought to occur in the springtime when higher seasonal precipitation and snow melt maximize recharge to the regional groundwater system.

Table 3.9.3-4

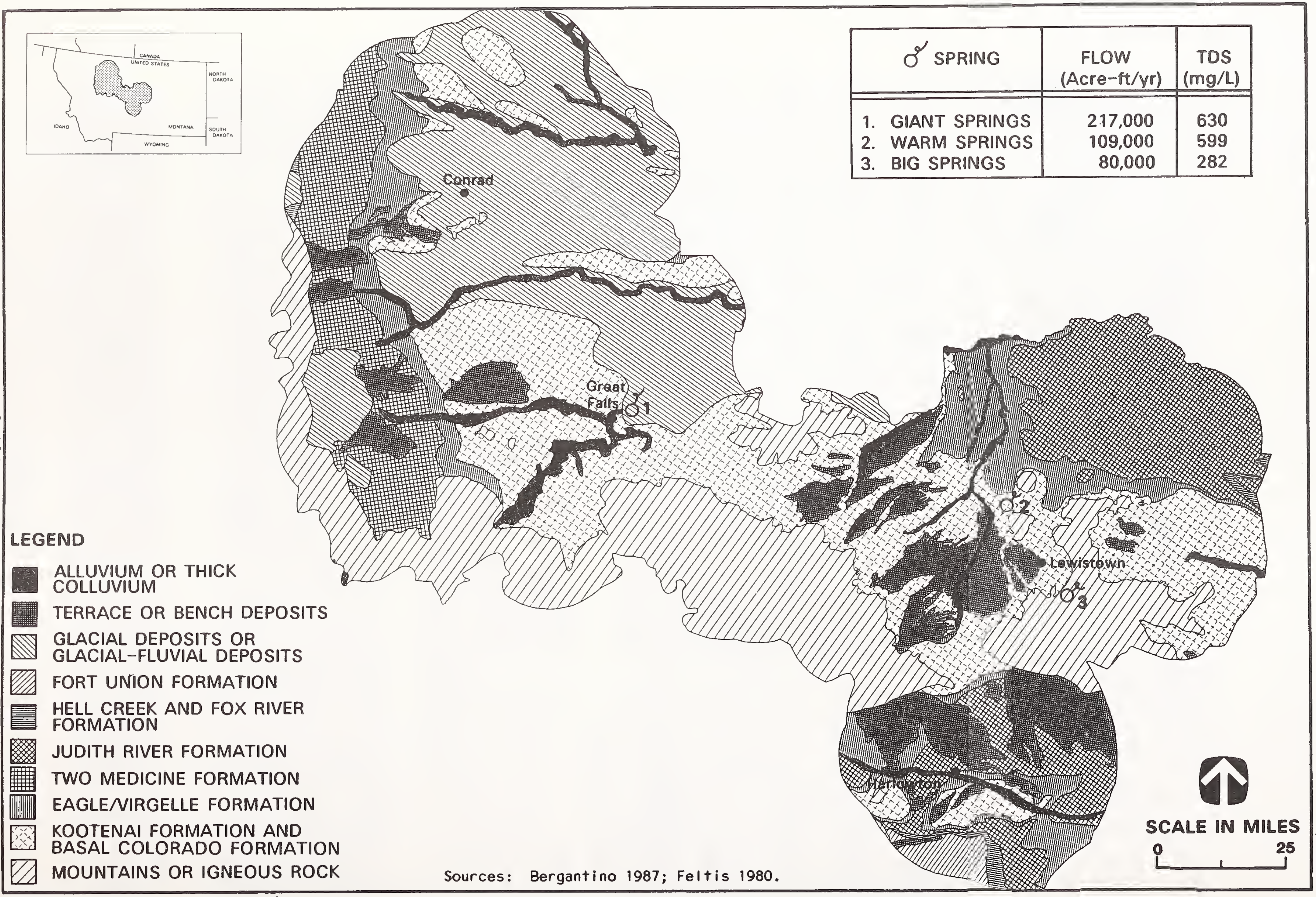
Selected Geohydrologic Data for Groundwater Aquifers in the Region of Influence

Aquifer	Composition	Approximate Thickness (ft)	Well Characteristics Depth (ft)	Well Characteristics Yield (gpm)
Alluvium and Terrace Deposits	Unconsolidated sand, silt, and clay	50	20-40	5-50
Fort Union	Interbedded shale, siltstone, sandstone, and coal	200	50-300	15-25
Fox Hills-Hell Creek	Sandstone with some siltstone and shale	600	150-500	5-20
Judith River	Sandstone with shale, siltstone, lignite, and coal	700	200-600	5-15
Eagle	Sandstone and shale	200	100-800	10-20
Black Leaf (Colorado Group)	Sandstone	400	20-100	6-40
Kootenai (Basal Sandstone)	Sandstone	100	100-900	5-50
Swift	Sandstone, shale, limestone, and dolomite	200	300-2,000	5-50
Madison	Limestone, dolomite, anhydrite, and halite	1,000	500-3,000	20-500

Sources: Feltis 1980; Levings 1982; Nobel et. al 1982; American Association of Petroleum Geologists 1983; Davis and Rogers 1984.

Groundwater development in the ROI has been relatively limited and no large-scale regional declines in groundwater levels have occurred. Declines in groundwater levels have been relatively localized. Examples include a decline in the potentiometric level of an artesian aquifer west of the Town of Geyser in the central portion of the ROI. No state-designated groundwater management areas, where special restrictions on groundwater development apply, exist within the ROI. Nevertheless, the state recognizes the important contribution that shallow aquifers can have in maintaining streamflow and has moved to limit new groundwater development in several water-short areas in the northwestern portion of the ROI.

An interesting groundwater feature is Giant Springs, which is one of the largest springs in the world and is located on the south bank of the Missouri River about 3 miles downstream of downtown Great Falls. The flow of the springs is unusually large (nearly 0.5 million acre-ft/yr), and it is fed by waters from the Madison Aquifer whose recharge



SPRING	FLOW (Acre-ft/yr)	TDS (mg/L)
1. GIANT SPRINGS	217,000	630
2. WARM SPRINGS	109,000	599
3. BIG SPRINGS	80,000	282

Sources: Bergantino 1987; Feltis 1980.

FIGURE 3.9.3-3 PRINCIPAL AQUIFERS AND MAJOR SPRINGS IN THE REGION OF INFLUENCE

EM3-WR/5

area is the Little Belt Mountains, south of the city. A local alluvial aquifer is also thought to contribute to the springs. The TDS concentration is 630 mg/l. Two other major springs occur in the eastern portion of the ROI: Warm Springs and Big Springs (Figure 3.9.3-3). These springs are also fed by the Madison Aquifer and their respective average discharges are 109,000 and 80,000 acre-ft/yr. The TDS concentrations of Warm Springs and Big Springs average 599 and 282 mg/l, respectively.

A major water quality problem with the shallow groundwater in the ROI is the incidence of saline seep, a condition where wet, salty areas develop in nonirrigated soils and result in the elimination of agriculture. The problem is often caused by precipitation moving through the root zone and into salty substrata when a field lies fallow. The shallow groundwater picks up dissolved solids and resurfaces downslope to form a salt-laden seep. Saline seep affects water quality by increasing the TDS concentration of shallow aquifers. Currently, some rural areas are experiencing degradation of drinking water. Many sources of livestock water are being abandoned because of salinization; aquatic life, fisheries, and irrigation are also being affected. Saline-seep problems are prevalent in the northwestern and southern portions of the ROI. Saline-seep concerns have grown to the point where it affects 280,000 acres of cropland in Montana and is costing $11 million per year because of reduced farm production and related problems. This problem could affect up to 1.8 million acres within 20 years. In 1979, the Montana Legislature approved funding to provide technical assistance to farmers to implement saline-seep control practices. Growing deep-rooted perennial crops and switching to flexible intensive cropping systems are included in such control practices.

Potential environmental threats to groundwater are oil exploration, leachates of hazardous wastes and heavy metals from landfills located in aquifer-recharge areas, and percolation of heavy metals, boron, and other dissolved solids from settling ponds used by mining activities. Yet, as of 1987, no major groundwater pollution incidents have been reported in the ROI (Noble et al. 1982). At Malmstrom AFB, depth to groundwater is between 100 and 200 feet. Poorly, percolating soils cover the southern two-thirds of the base and further serve to protect the underlying aquifer from contaminating substances which may escape to the ground surface.

No major groundwater developments are expected to occur in the ROI during the projected period. However, as surface water sources become more heavily appropriated, groundwater becomes the alternative source available for many new developments. Therefore, it is reasonable to assume that increasing withdrawals from groundwater sources will be necessary to supplement long-duration demands. In fact, low-flow augmentation of irrigation water and the transfer of subsurface waters between river basins are now being considered by state officials as partial, long-term solutions to the severe shortages experienced by many irrigators in the ROI. In this regard, the MBMG is currently studying the potential for the use of groundwater in the area north of Choteau to alleviate the seasonal shortages of surface water that frequently occurs there. In addition, the MDNRC is considering pumping water from abandoned coal mines into the Musselshell River for use by irrigators.

3.9.3.3 Water Use

The vast majority of the water used in the ROI (99%) is supplied by surface water sources. Total water use in the ROI amounted to approximately 1.9 million acre-ft in 1980. The seasonal variation in quantity, rather than quality, is the primary constraint on surface water use. Table 3.9.3-5 summarizes water use in the ROI by major categories.

Table 3.9.3-5

1980 Water Use in the Malmstrom AFB Region of Influence (acre-ft)

Category	Supplied by Surface Water	Supplied by Groundwater	Total
Agricultural Irrigation	1,874,000	16,000	1,890,000
Municipal	17,000	6,000	23,000
Military	1,200	0	1,200
Rural	3,600	2,400	6,000
Industrial	800	200	1,000
TOTAL:	1,896,600	24,600	1,921,200

Source: MDNRC 1986.

Agricultural irrigation is the dominant water use accounting for 98 percent of the total. In 1980, approximately 1.89 million acre-ft were diverted in the ROI for irrigation. Over one-half of that amount became conveyance losses and only about 20 percent of the total diversions were used consumptively for crops. The great majority of the irrigation water is derived from surface water sources, with the Musselshell, Sun, and Teton rivers and the upper Marias River drainage supplying most of the water. The salient irrigation project in the ROI is the Greenfields Irrigation District, which diverted 230,000 acre-ft from the Sun River in 1986 (Figure 3.9.3-4). Several irrigated areas in the ROI experience water shortages because of seasonal low flows in the late summer aggravated by older, low-efficiency irrigation systems. Water shortages are common in the drainages of the Birch, Sun, Teton, and Musselshell rivers as indicated in Figure 3.9.3-4.

Municipal water use in the ROI amounted to approximately 23,000 acre-ft in 1980; a majority of this water use occurred at Great Falls. Recent and projected municipal water use for the major entities in the ROI is presented in Table 3.9.3-6. Great Falls obtains all of its supply from the Missouri River and holds water rights to withdraw 73,120 acre-ft/yr. This supply is more than adequate for the existing and projected water demands of the city. Lewistown obtains its water supply from Big Springs, which is located southeast of the city and holds water rights amounting to approximately 4,200 acre-ft/yr. This amount is adequate to meet the projected water requirements of the city, though occasionally, voluntary water restrictions are put into effect in the summer, which is a peak landscape-irrigation period. Conrad obtains its water from the Pondera County Canal and Reservoir Company via Lake Frances, located 12 miles to the northwest. The lake is fed by diversions from Birch and Dupuyer creeks. Conrad owns shares for up to 3,270 acre-ft/yr, depending on the amount of water stored in the lake. The city's entitlement is considered adequate to meet its anticipated water requirements throughout the projected period.

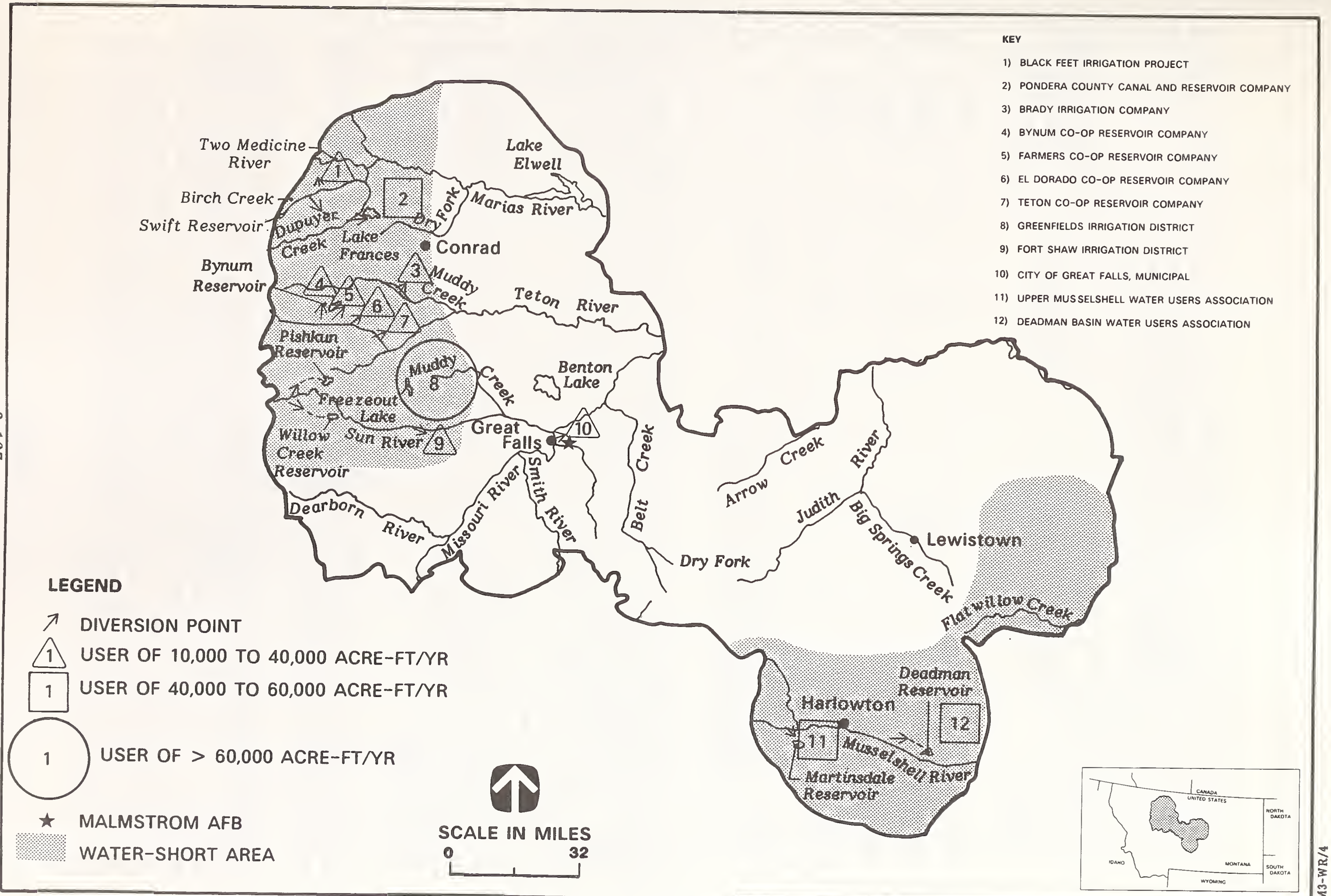


FIGURE 3.9.3-4 SCHEMATIC LOCATION OF MAJOR DIVERSIONS AND WATER-SHORT AREAS IN THE MALMSTROM AFB REGION OF INFLUENCE

Table 3.9.3-6

Current and Projected Municipal Water Use for Major Entities in the Region of Influence

Entity	Primary Source[1]	1986 Use (acre-ft/yr)	Per Capita Use (gpcd)[2]	Projected Use Year 2000 (acre-ft/yr)
Malmstrom AFB	SC	1,230	177	1,460
Great Falls[3]	S	13,040	180	14,060
Lewistown	SP	2,020	253	2,130
Conrad	S	500	145	660

Notes: [1]S = surface water; SC = support community; SP = springs.
[2]gpcd = gallons per capita per day.
[3]Includes water used at Malmstrom AFB.

Malmstrom AFB obtains all of its water from the support community of Great Falls. The base currently has a contract for water delivery with Great Falls of 1,410 acre-ft/yr. However, an increase may have to be renegotiated to meet future baseline onbase water needs. Nearly all the military water use in the ROI occurs at Malmstrom AFB. The base used 1,230 acre-ft in 1986 at a per capita rate of 177 gallons per capita per day (gpcd). An additional 16 acre-ft/yr are used in the deployment area at the 20 launch control facilities. Malmstrom AFB has other programs scheduled to occur by 1990. Baseline water use at the base is projected to increase to 1,460 acre-ft/yr in 1990, as a result of the KC-135R air refueling mission, and remain relatively constant throughout the projected period. The hydraulic capacity of the city's water supply system to the base is adequate to meet the future baseline water demands of the base throughout the projected period. The two city water mains serving the base can supply at least 3,800 acre-ft/yr.

Rural use consists of self-supplied domestic use and water consumed by livestock. This category amounted to approximately 6,000 acre-ft of water in 1980; 40 percent of that water was derived from groundwater supplies.

Self-supplied industrial use, excluding hydroelectric power generation, amounted to approximately 1,000 acre-ft in 1980, accounting for the least amount of water used in the ROI. The main source of supply for industrial use is surface water, which provides 80 percent of the water consumed by self-supplied industries. Hydroelectric power generation is also an important water use along the Missouri River. Montana Power Company operates six dams on the river within the ROI with a total installed capacity of 259 megawatts (MW). There are two other major hydroelectric dams in north-central Montana: Canyon Ferry Dam has an installed capacity of 50 MW, while Fort Peck Dam has an installed capacity of 185 MW.

No major changes in water use patterns are expected to occur in the ROI during the projected period. County-level statistics show that the total acreage of irrigated land has changed little within the ROI in the 1980s. Therefore, agricultural water use has remained fairly constant with the exception of 1985, which was a drought year. There are no major new agricultural development projects scheduled to be constructed within the ROI. Therefore, agricultural and rural water uses should change little over the projected period. Similarly, low market values in recent years have severely curtailed oil exploration and production and the mining and processing of copper and other base metals limiting industrial use. Municipal water use should continue to rise slowly through the projected period.

The Montana Water Use Act of 1973 adopted the appropriation doctrine. Under this doctrine, an individual or an entity may obtain a right to a particular peak flow and/or volume of water annually from a specified source, with priority based upon the date of appropriation. This water must be applied to a specified beneficial use. In times of water shortages, appropriators with more recent (junior) rights must cease water diversions in order to allow those with older (senior) rights to receive their full allocations. The MDNRC is responsible for reviewing applications for permits to appropriate water that are required for new appropriations of more than 100 gpm. The permit to appropriate water is a provisional document and will be replaced by a certificate of water right when the stream or area is adjudicated. To date, only a small number of basins have been fully adjudicated in Montana. The Montana Water Use Act of 1973 also has provisions for the MDNRC to approve the reservation of water for public use and for instream flow purposes such as habitat maintenance and recreation. Changes in water use and transfers of water rights are allowed under the Act with the approval of the MDNRC. An exception is that appropriators of more than 10,000 acre-ft/yr may not change the purpose of the use from agricultural to industrial. Groundwater appropriation in excess of 3,000 acre-ft/yr requires legislative approval unless the appropriation is for municipal or public water supply purposes, or to irrigate land owned and operated by the applicant. For water use applications requesting more than 10,000 acre-ft/yr, the applicant must show that the rights of the previous appropriators will not be adversely affected.

Because of protests from hydroelectric dam operators, new surface water appropriations requested for the Missouri River drainage above Great Falls have not been granted by the State over the last several years. Applications for new appropriations in the upper to middle portions of the Sun, Teton, and Marias River drainages receive very close scrutiny from the state due to existing, periodic shortages resulting from intensive irrigation. In addition, the state is considering closing the Musselshell Basin to further surface water appropriations. The state has also been carrying out negotiations with the Indian tribes of Montana for a number of years to reach agreement on tribal water rights. While agreement has been reached with several tribes, no such agreement has been reached with the Blackfeet tribe in the northwestern portion of the ROI. Streams flowing from this reservation make up most of the flow of the upper Marias River and their ultimate legal status is likely to remain uncertain for some time. Finally, no formal, interstate compact exists regarding the apportionment of the waters of the Missouri River among the Upper Missouri River Basin states, which include Montana.

3.10 Geology and Soils

The proposed program would consume or use geologic and soils resources within the program area. Program demand could affect the supply and production of some geologic resources. Typical geological materials that could be affected include aggregate, oil, gas, and coal. Soil resources may be affected through increased erosion due to construction activities. Proposed program interaction with geologic conditions (such as mass movements) may affect public health and safety. The analysis of geology and soils has been divided into considerations of geologic hazards, geologic resources, and soil erosion, which cover the range of issues relevant to the Small Intercontinental Ballistic Missile (ICBM) program at Malmstrom Air Force Base (AFB).

3.10.1 Resource Description

Those elements of the geology and soils resource that were considered important in the Legislative Environmental Impact Statement (LEIS) are addressed in detail in this site-specific Environmental Impact Statement (EIS) for Malmstrom AFB and the deployment area. The elements are geologic hazards (including seismicity, seismic effects, and mass movements), geologic resources (including aggregate, oil and gas, and coal) and soil erosion (including wind and sheet erosion). Important farmlands covered in the LEIS are discussed in Section 3.4, Land Use.

3.10.1.1 Geologic Hazards

Geologic hazards include those physical or chemical geologic features that interact adversely with the works of man. These hazards can be naturally occurring geologic phenomena or those caused by man. The hazards considered include seismicity and seismic effects and mass movements.

3.10.1.2 Geologic Resources

Geologic resources include aggregate resources and energy resources. Aggregate resources consist of sand and gravel that would be used for facility construction at Malmstrom AFB and in the deployment area. Energy resources discussed include oil, gas, and coal. In addition, certain program activities (e.g., expansion of fee-owned areas at launch facilities) may restrict access to areas considered valuable for energy resource exploration.

3.10.1.3 Soil Erosion

Ground-disturbing activities associated with the proposed program have the potential to initiate or accelerate soil erosion. Program activities such as road upgrades, bridge modifications, and facility construction are expected to alter the physical characteristics (e.g., slope and vegetation) that control the rate of soil erosion. The wind and sheet erosion subelements were used to determine program effects on soil erosion. Erosion issues also affect the biological environment as well as water quality. These aspects are discussed in Section 3.8, Biological Resources and Threatened and Endangered Species and Section 3.9, Water Resources.

3.10.2 General Analysis Methodology

Baseline conditions for the proposed program area were determined from site-specific geology and soils data collected from publications of government agencies such as the

U.S. Geological Survey (USGS), Soil Conservation Service (SCS), Montana Bureau of Mines and Geology, and other local, state, and federal agencies. In addition to these sources, data collected by the Air Force during the area narrowing process were used in evaluating baseline conditions. Computerized data bases were used to provide additional data on soils.

The geologic and soils data were compiled and entered into a computerized data base system for retrieval during impact analysis. Large-scale aerial photography was used to identify and compile some geologic and soil characteristics in the region (e.g., mass movements). Field reconnaissance was used to verify the compiled information. The aerial photography was also used to assist in integration of slope, soils, and vegetation data at potential construction sites within the program area.

Geologic conditions generally change at a very slow rate; therefore, the past and present geologic conditions effectively identify future conditions over the operations life of the proposed program.

3.10.2.1 Region of Influence

The Region of Influence (ROI) is different for each element of the geology and soils resource. The ROI for each element is limited to the area directly affected by the construction and upgrading of facilities at Malmstrom AFB and in the deployment area, and the demand for resources by the program. The ROI for this EIS was selected to evaluate potential site and local effects where possible, whereas the ROI for the LEIS was selected to identify regional effects.

The ROI for geologic hazards (Figure 3.10.2-1) includes the area encompassing direct and indirect effects of the construction, deployment, and operation of the Small ICBM Program. More specifically, the ROI includes Malmstrom AFB, construction sites in the deployment area, and geologic conditions near those areas that may potentially affect or be affected by the proposed program.

The aggregate resources ROI is the area encompassed by a 30-mile buffer around the transporter/erector (T/E) route network, launch facilities, and Malmstrom AFB (Figure 3.10.2-2) and reflects the haul distance for aggregate. The energy resources ROI includes construction sites at the base and launch facilities in the deployment area as well as expanded areas on the base and at the launch facilities (Figure 3.10.2-1) where the proposed program may affect resource exploration, development, or production.

The ROI for soil erosion includes those areas affected by construction at Malmstrom AFB and the deployment area. For the base, the ROI includes the installation plus a 1-mile buffer including the potential construction, housing, and training areas. In the deployment area, the ROI includes areas within 1,000 feet of the T/E route system or expansion areas of the launch facilities. The ROI also includes areas where bridges need to be replaced or upgraded.

3.10.2.2 Geologic Hazards

Geologic hazards considered during site-specific EIS studies include seismicity and seismic effects and mass movements (i.e., landslides). Seismicity and seismic effects were evaluated on a regional basis because of the regional nature of the potential effects. Seismicity was determined by evaluating the historic seismicity and tectonics of the region and seismic effects (e.g., faulting) were evaluated by identifying the faulting

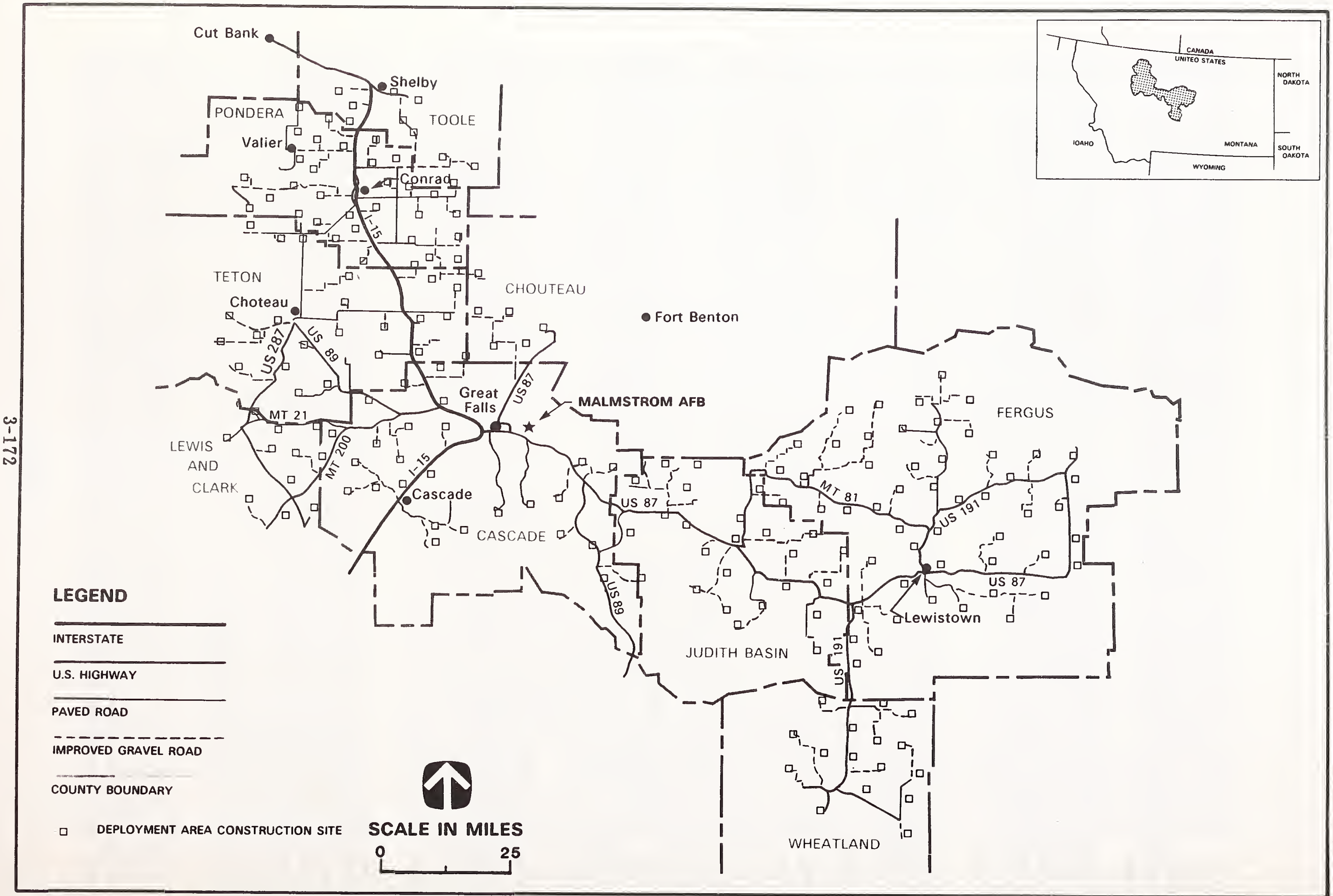


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FIGURE 3.10.2-1 REGION OF INFLUENCE FOR SOIL EROSION, GEOLOGIC HAZARDS, AND ENERGY RESOURCES

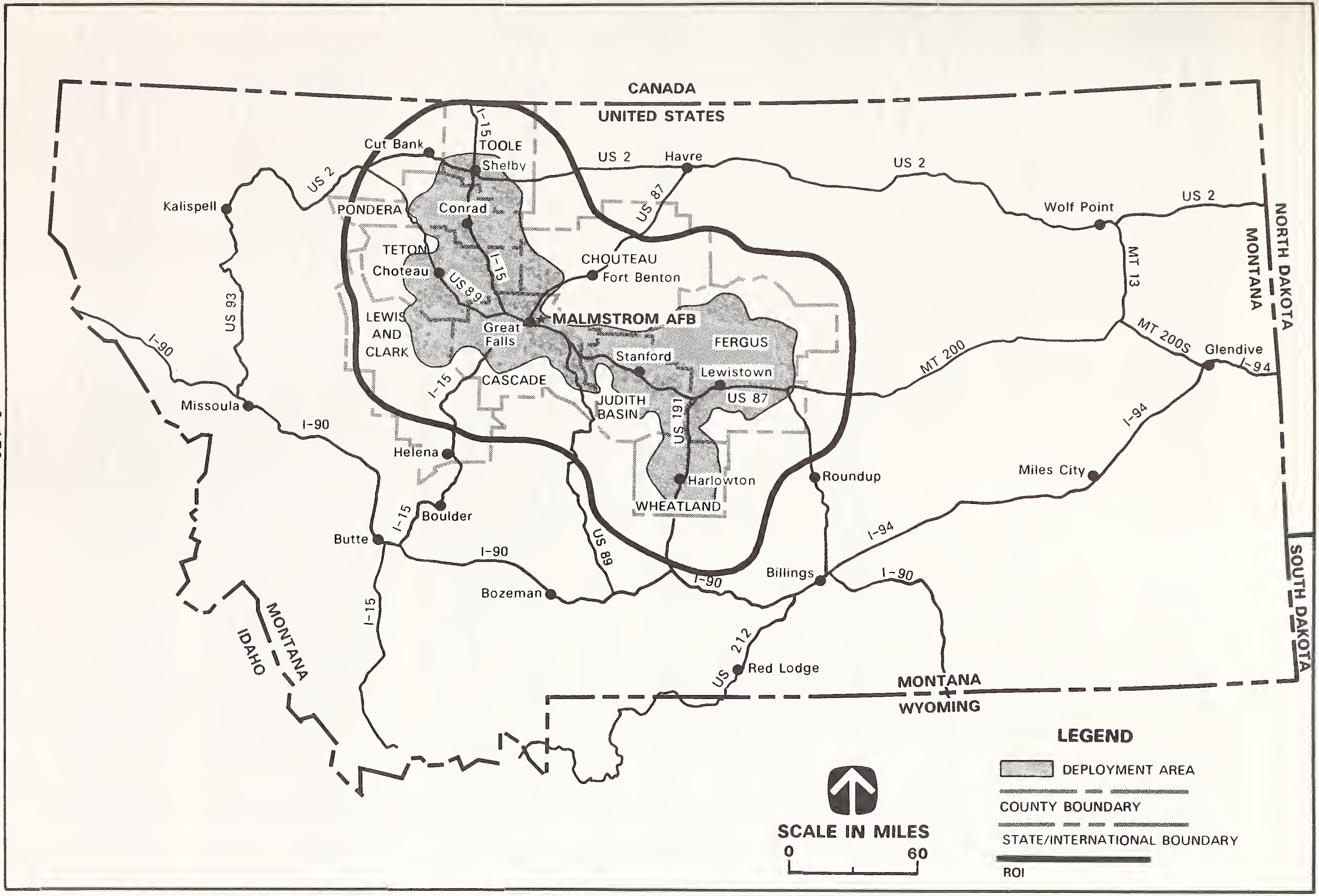

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FIGURE 3.10.2-2 REGION OF INFLUENCE FOR AGGREGATE RESOURCES

regime and geologic history of the program area. Landslide potential was determined for areas along the T/E routes and bridge construction sites, near the launch facilities, and for Malmstrom AFB by identifying areas with geologic characteristics (e.g., bedrock type and slope) known to contribute to slope instability and where previous events have occurred.

3.10.2.3 Geologic Resources

Preliminary data gathered and evaluated for the LEIS indicated that aggregate resources, oil, gas, and coal should be studied further during site-specific EIS analyses.

Baseline conditions for aggregate resources were determined by contacting existing aggregate producers in the deployment area and obtaining estimates of current production rates and capacities, as well as approximations of aggregate reserves for each operation. Potential source areas for aggregate were identified and samples were analyzed to determine the suitability of the potential sources for use in concrete and as road-surfacing material. Oil and gas-leasing activities near the launch facilities as well as proximity to known producing areas were used as a measure of the potential for future production of these resources in the deployment area. The location of coal deposits in the deployment area, the degree of mineability, and production status of coal-mining operations were determined in the baseline evaluations.

3.10.2.4 Soil Erosion

Baseline soil erosion conditions were determined primarily from maps obtained from the SCS, tabular soils data from the U.S. Army Corps of Engineers (COE) Construction Engineering Research Laboratory, and professionals knowledgeable about soils in the deployment area. Soil types were identified for areas within about 1,000 feet of the T/E routes and for all other areas likely to be disturbed by the proposed program in the ROI.

The analyses of soil erosion compared the effects of wind and sheet erosion to the maximum tolerable soil losses defined by the SCS. Maximum tolerable soil losses represent the maximum level of soil erosion that will permit a high level of vegetative productivity to be sustained economically and indefinitely. Soil erosion rates were estimated by using the Wind Erosion Equation and Universal Soil Loss Equation.

3.10.3 Existing and Future Baseline Conditions

Malmstrom AFB and the deployment area are located in north-central Montana within the northern section of the Great Plains Physiographic Province. The ROI is characterized by rolling high plains interrupted by isolated mountain ranges rising 2,000 to 4,000 feet above the surrounding plains. The Little Belt Mountains and the Highwood Mountains divide the deployment area into eastern and western sections. The eastern section consists of a series of buttes with elevations between 5,000 and 7,600 feet. The western section extends northward from the Little Belt Mountains almost to the Canadian border and consists of high plains at an average elevation of 3,000 feet. These plains are interrupted by scattered buttes and low ridges.

Rocks of Precambrian to Quaternary age are exposed in the deployment area. Igneous and metamorphic rocks (Precambrian gneiss, schist, quartzite, and argillite and Tertiary crystalline rocks) form the core of most mountains, and Paleozoic sedimentary rocks (marine sandstone, shale, limestone, and dolomite) are exposed in all except the Highwood Mountains. Mesozoic rocks occur throughout the prairie areas with shales

(Colorado and Bearpaw shales of Cretaceous age) forming the near surface bedrock. Quaternary glacial till, stream and lake deposits, and alluvium comprise the surficial deposits.

The western portion of the deployment area lies at or near the eastern limit of the Northern Rocky Mountain Disturbed Belt. The belt is a zone of compound thrust faults trending roughly northwest-southeast, and is represented by a series of parallel folds. Several mapped faults in the western portion of the deployment area have a northeast-southwest trend nearly perpendicular to the thrust faults of the Disturbed Belt. Most of the western portion of the deployment area east of the Disturbed Belt lies on the Sweetgrass Arch, an anticlinal fold which stretches northwest from Great Falls into Alberta, Canada. The Kevin-Sunburst Dome forms the northern part of the Sweetgrass Arch and is a major source of oil and gas in the state.

3.10.3.1 Geologic Hazards

The ROI is characterized by low-level seismicity. No active faults have been identified within the deployment area. A moderate potential for landsliding exists in areas underlain by Cretaceous-age shale.

Seismicity and Seismic Effects. The deployment area lies in the Great Plains of north-central Montana and is characterized by widely scattered, low-level seismicity and a maximum credible earthquake (MCE) magnitude (Richter) of 6.5. Most seismic activity occurs west of the deployment area in the Disturbed belt (Figure 3.10.3-1). Seismic intensity and magnitude scales are shown in Figure 3.10.3-2). Although the deployment area is characterized by low-level seismicity, features with potential for seismic activity are present in the western portion of the deployment area.

Geologic features of interest lie on the southern part of the Sweetgrass Arch and include the northeast-trending Pendroy Fault, Scapegoat-Bannatyne Trend, Rock Creek-Bynum Trend, and other minor, parallel trends (Figure 3.10.3-1). Topographic alignments and geophysical anomalies characterize the Pendroy Fault and Scapegoat-Bannatyne Trend, and to a lesser degree the Rock Creek-Bynum Trend. Recent investigations suggest these geologic features are part of an old zone of crustal weakness extending from Boise, Idaho into Saskatchewan, Canada, referred to as the Great Falls Tectonic zone. Faults in this zone were recurrently active from 1 billion years before present (B.P.) to the Holocene (<10,000 years B.P.); however, evidence for Holocene activity has not been identified within the deployment area.

The Pendroy Fault exhibits fractured bedrock of Cretaceous age as observed during past geologic investigations for launch facility and launch control facility construction. Offset Precambrian basement rock revealed by magnetic and gravity data and disturbed, near-surface Cretaceous units suggest that the Pendroy Fault and Scapegoat-Bannatyne Trend have experienced recurrent movement over a long period of geologic time. No displacement of younger Holocene (<10,000 years. B.P.) deposits overlying these zones have been identified; therefore, these trends are not considered active. The Rock Creek-Bynum Trend is recorded on recent geologic maps; however, detailed information regarding this structure was not available.

The future level of seismic activity is not expected to be different from that displayed over the past 10,000 years. However, the short record of instrumental seismic activity in the region makes it difficult to predict future conditions.

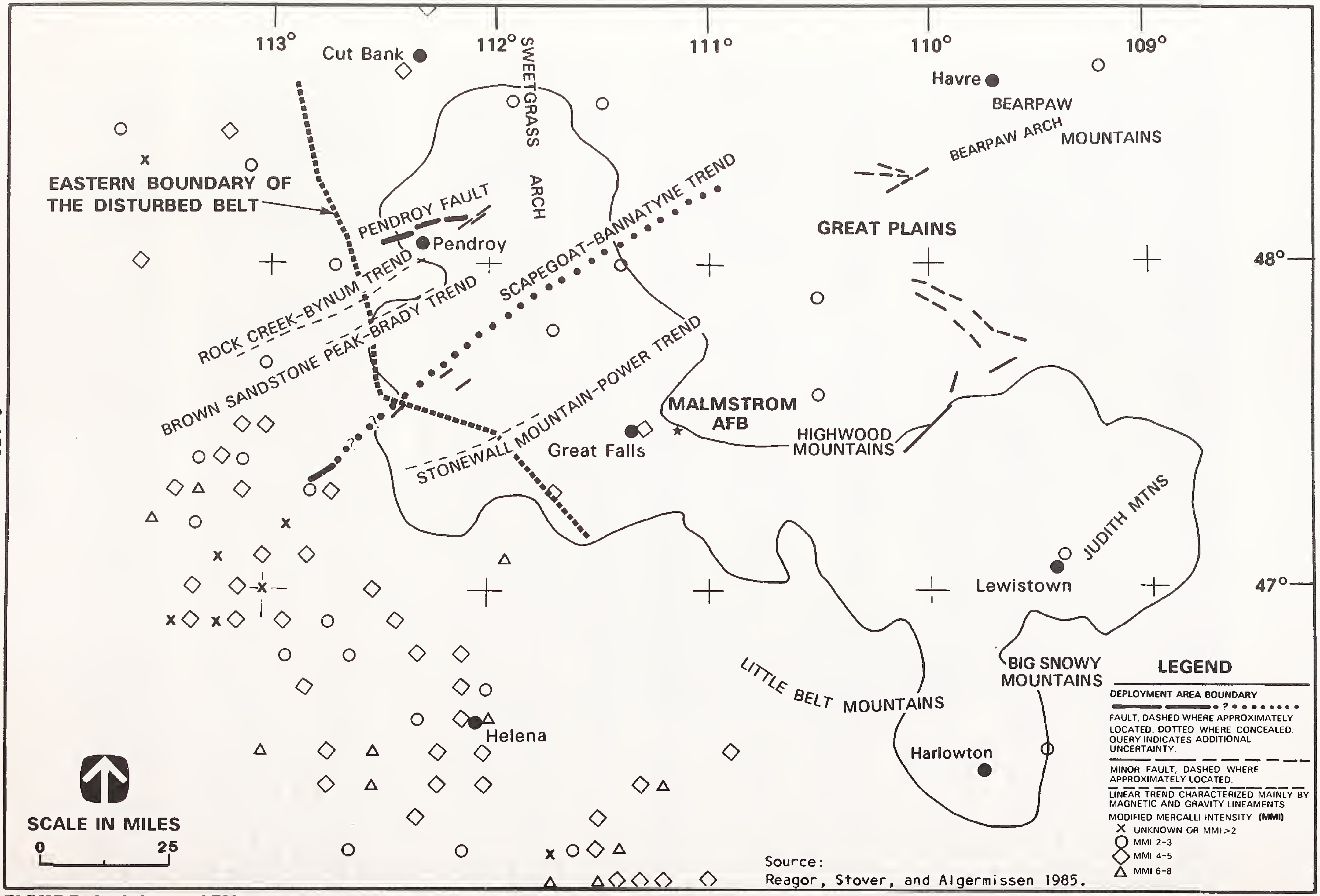

FIGURE 3.10.3-1 SEISMICITY AND MAJOR STRUCTURAL FEATURES IN THE MALMSTROM AFB DEPLOYMENT AREA

ROSSI-FOREL INTENSITY SCALE	ABRIDGED MODIFIED MERCALLI INTENSITY SCALE	
I	I	Not felt except by a very few under especially favourable circumstances.
II	II	Felt only by a few persons at rest, especially on upper floors of buildings. Delicately suspended objects may swing.
III	III	Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake. Standing motor cars may rock slightly. Vibration like passing of a truck. Duration estimated.
IV, V	IV	During the day felt indoors by many, outdoors by few. At night some awakened. Dishes, windows, and doors disturbed; walls make creaking sound. Sensation like heavy truck striking building. Standing motor cars rocked noticeably.
V, VI	V	Felt by nearly anyone; many awakened. Some dishes, windows, etc., broken; a few instances of cracked plaster; unstable objects overturned. Disturbance of trees, poles and other tall objects sometimes noticed. Pendulum clocks may stop.
VII	VI	Felt by all; many frightened and run outdoors. Some heavy furniture moved; a few instances of fallen plaster or damaged chimneys. Damage slight.
VIII	VII	Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures; some chimneys broken. Noticed by persons driving motor cars.
VIII, IX	VIII	Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures. Panel walls thrown out of frame structures. Fall of chimneys, factory stacks, columns, monuments, and walls. Heavy furniture overturned. Sand and mud ejected in small amounts. Changes in well water. Persons driving motor cars disturbed.
IX	IX	Damage considerable in specially designed structures; well designed frame structurres thrown out of plumb; great in substantial buildings, with partial collapse. Buildings shifted off foundations. Ground cracked conspicuously. Underground pipes broken.
X	X	Some well-built wooden structures destroyed; most masonry and frame structures destroyed with foundations, ground badly cracked. Rails bent. Landslides considerable from river banks and steep slopes. Shifted sand and mud. Water splashed (slopped) over banks.
X	XI	Few, if any, (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground. Underground pipelines completely out of service. Earth slumps and land slips in soft ground. Rails bent greatly.
X	XII	Damage total. Waves seen on ground surfaces. Lines of sight and level distorted. Objects thrown upward into the air.

Source: The Earth Technology Corporation 1984.
Note: These relationships are given to illustrate general comparisons for regional studies and should not be used for design parameters.

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FIGURE 3.10.3-2 SEISMIC INTENSITY-MAGNITUDE SCALE

Mass Movements. Mass movements that occur in the deployment area include landslides in both bedrock and overlying soil and rockfalls. Landsliding is most commonly associated with Cretaceous shales such as the Bearpaw, Claggett, and Colorado shales, which collectively cover roughly two-thirds of the deployment area (Figure 3.10.3-3). Landsliding has also occurred in Paleozoic shales in the Little Belt Mountains, surrounding buttes southwest of Great Falls, and in glacial lake deposits around Great Falls. Slumping of bedrock and soils commonly occurs throughout the deployment area along rivérs and streams cutting into the Colorado Shale. The entire length of the Judith River from about Hobson to its confluence with the Missouri River is particularly susceptible to this form of landsliding. Other rivers along which slumping is common include the Marias River south of Shelby, and the Sun and Missouri rivers west and southwest of Great Falls, respectively.

Rockfalls occur sporadically in hilly or mountainous portions of the deployment area, commonly where stream erosion or road cutting has resulted in a near vertical rock face. Areas where rockfalls are common and may require periodic clearing of debris from roads include the Teton and Dearborn River valleys in the southwestern portion of the deployment area, along Little Otter Creek southeast of Belt, and road and rivercuts in the northern Belt and Big Snowy mountains.

Because mass movements have been recorded in these areas, they must be considered susceptible to future mass movements. In general, those areas with slopes greater than 10 percent, and with Cretaceous or Paleozoic shale bedrock, may be prone to landsliding and slumping. Factors such as proximity to water, surficial deposits, and the presence of stream or roadcuts or fill also contribute to mass movement susceptibility. Areas highly susceptible to mass movements, other than those previously listed, include the extreme eastern edge of the Rocky Mountain Front Range, the area of Tertiary intrusives between Simms and Cascade, the Smith River and Belt Creek valleys south of Great Falls, the Highwood and northern Judith mountains, and the triangular area between Lewistown, Danvers, and Hilger. Smaller, isolated areas occur throughout the deployment area. Flights in areas susceptible to mass movement include G, H, L, and M, and the northern portions of flights B and D. The extreme northern portion of the ROI as well as the portion in Wheatland County are less susceptible to mass movements because of more gentle slopes. Mass movements in these areas are usually restricted to stream channels where cutbank erosion may lead to slumping.

3.10.3.2 Geologic Resources

An estimated 54 million short tons of aggregate (demonstrated and inferred sources) have been identified in the deployment area. Oil and gas leases or producing wells exist near launch facilities in flights P, Q, R, S, and T. Coal beds are located in the ROI but no proven mineable coal reserves have been identified in the ROI.

Aggregate Resources. Sand and gravel sources vary in composition, quality, and abundance on Malmstrom AFB and in the deployment area. The deployment area can be divided into three regions (Shelby-Conrad, Lewistown, and Great Falls) based on the distribution of aggregate production facilities (Figure 3.10.3-4). Aggregate suitable for road base or concrete may be derived from Quaternary glacial and stream deposits in the northern portion of the deployment area (the Shelby-Conrad region). These aggregate sources consist mainly of limestone, sandstone, quartzite, and granite materials. About 1.2 million tons of demonstrated commercial and noncommercial reserves and 18.5 million tons of inferred commercial and noncommercial reserves occur in this region. In the eastern portion of the deployment areas (the Lewistown region), road base

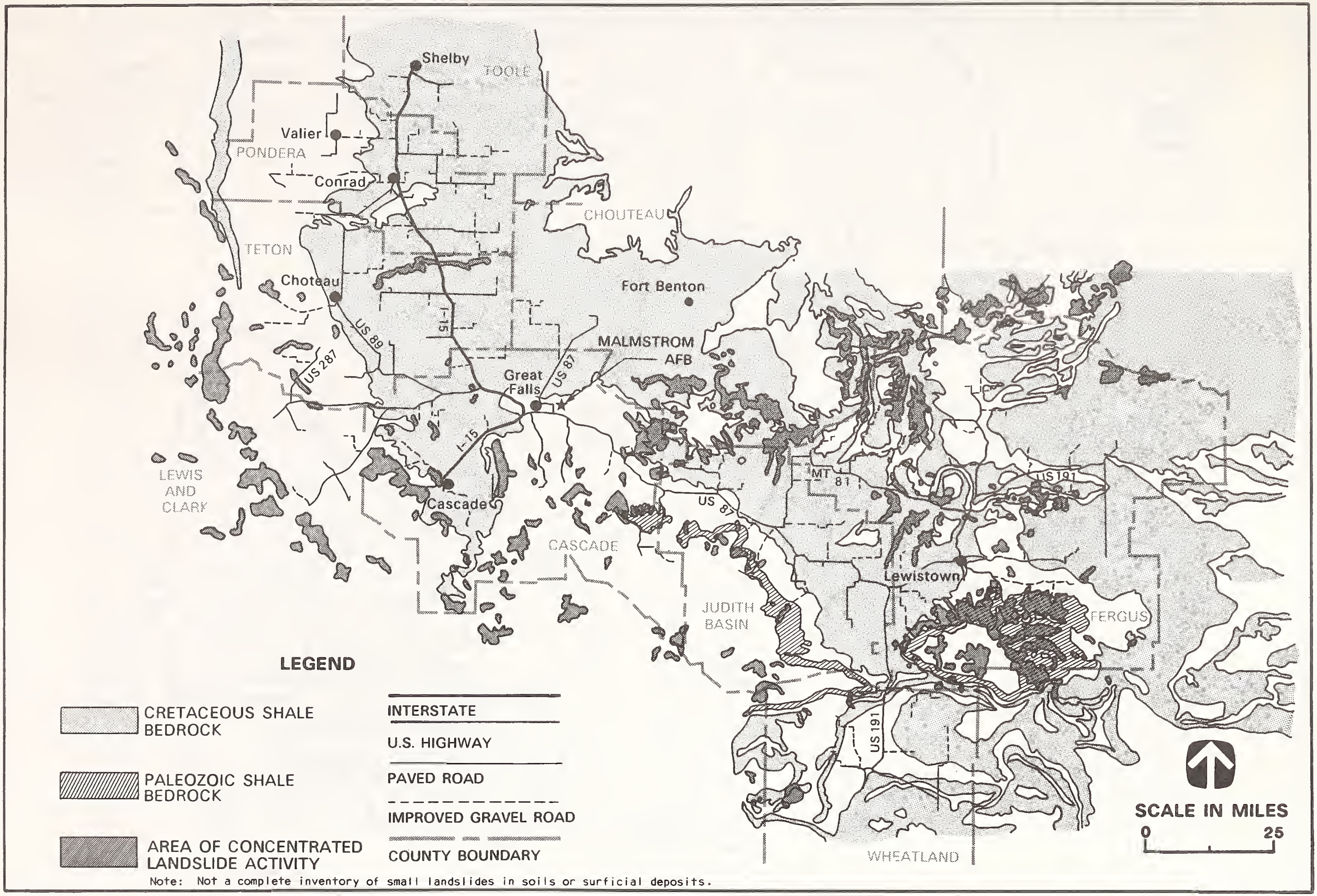

FIGURE 3.10.3-3 LANDSLIDE AND LANDSLIDE-PRONE BEDROCK AREAS

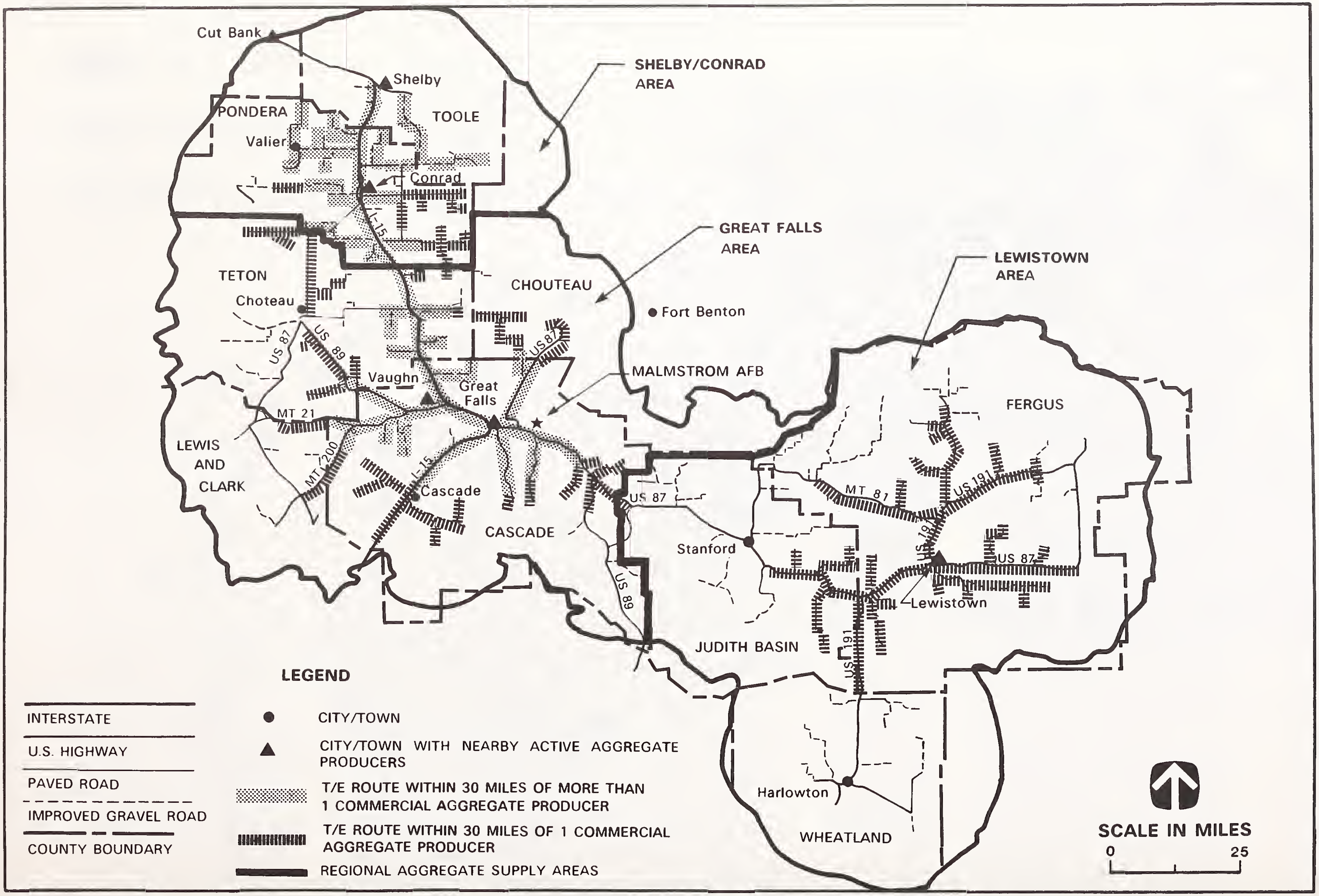

FIGURE 3.10.3-4 AGGREGATE RESOURCES IN THE MALMSTROM AFB DEPLOYMENT AREA

and concrete aggregate sources are found in fluvial deposits and are derived predominantly from igneous rock; gravel sources are limited. No demonstrated reserves have been reported but about 15.3 million tons of inferred commercial and noncommercial reserves occur in this region. Road base and concrete aggregate sources in the central portion of the deployment area (the Great Falls region) are derived from Missouri River terrace and stream deposits. These are derived mainly from sandstone and quartzite sources with varying amounts of igneous rock. Most deposits in this area are sandy, and any gravel-sized material is generally limited and of poor quality. More than 5.1 million tons of demonstrated commercial and noncommercial reserves and 13.6 million tons of inferred commercial and noncommercial reserves have been identified in this region.

Aggregate producers are found in the northern (Shelby-Conrad), eastern (Lewistown), and central (Great Falls) regions of the deployment area. Commercial production data for the various regions are shown in Table 3.10.3-1. Baseline consumption is roughly equivalent to annual production since aggregate is usually produced on demand. Aggregate required for the KC-135R air refueling mission and maintenance of the existing Minuteman T/E route system is included in baseline demand. Future commercial production and reserves are difficult to predict but the several billion tons of hypothetical reserves identified in the deployment area are expected to provide road base and concrete aggregate sufficient for baseline requirements for the foreseeable future.

It is expected that only the larger operators will maintain year-round production; smaller operations are generally open 9 months out of the year because of weather constraints and decreased demand during the winter months. Future baseline commercial production and reserves are expected to remain near levels shown in Table 3.10.3-1 as a result of the low level of projected growth in the ROI.

Oil and Gas. Large portions of land throughout the deployment area have been leased for oil and gas exploration. Ninety-nine of the launch facilities, or about 50 percent, lie within 0.5 mile of an oil or gas lease, and 62 lie directly adjacent to a lease. Most of the launch facilities are concentrated in four areas (Figure 3.10.3-5): along the Sweetgrass Arch in Pondera and Toole counties (flights P, R, S, and J), along the Sun River west of Great Falls (flights F, G, H, and I), to the north and east of the Judith Mountains near Lewistown (flights E and O), and surrounding Judith Gap in the southern portion of the deployment area (flights L and M). Eight launch facilities (P-5, P-10, R-22, R-28, S-35, S-37, T-45, and T-49) are located within the boundaries of oil or gas fields, including three in the Pondera field, and eight (P-3, P-5, Q-15, R-22, S-36, S-37, T-45, and T-49) are located within 1 mile of a producing oil or gas well. Current oil or gas production within the deployment area occurs in the northwestern portion along the Sweetgrass Arch, and near the eastern portion of the deployment area on the Bearpaw Uplift, in the Big Horn Basin, and in the Bull Mountain area. In 1985, 17 oil and gas fields located within the boundaries of the deployment area produced about 1.5 million barrels of oil and nearly 5 million cubic feet of natural gas, accounting for 5 percent and 9 percent, respectively, of the state's production. Exploratory drilling in the Sweetgrass Arch proved successful in 1985 with a success rate of 35 percent for wildcat wells, which was the highest success rate in Montana, exceeding the 1984 rate by 5 percent. However, many of the oil and gas fields in the Sweetgrass Arch, including the most productive, are currently in secondary recovery utilizing injection wells.

Coal. Sub-bituminous coal is found in the Great Falls-Lewistown coal field, which covers much of the central portion of the ROI, though more economical deposits occur elsewhere in the state. Bituminous coal is found on the eastern flank of the Rocky

Table 3.10.3-1

Aggregate Resources
in the Deployment Area

Region	Number of Producers	Current Production Rate (Million Tons/Yr)	Maximum Production Capacity (Million Tons/Yr)[1]
Northern (Shelby-Conrad)	2	0.59	0.74
Eastern (Lewistown)	2	0.16	0.20
Central (Great Falls)	8	1.92	2.40

Region	Demonstrated Commercial Reserves (Million Tons)	Inferred Commercial Reserves (Million Tons)	Demonstrated Noncommercial Reserves (Million Tons)	Inferred Noncommercial Reserves (Million Tons)
Northern (Shelby-Conrad)	1.23	2.55	0	15.97
Eastern (Lewistown)	N/A[2]	0.78	0	14.55
Central (Great Falls)	5.12	3.56	0	10.07

Notes: [1]Estimated 25% above current production rate.
[2]N/A = Data not available.

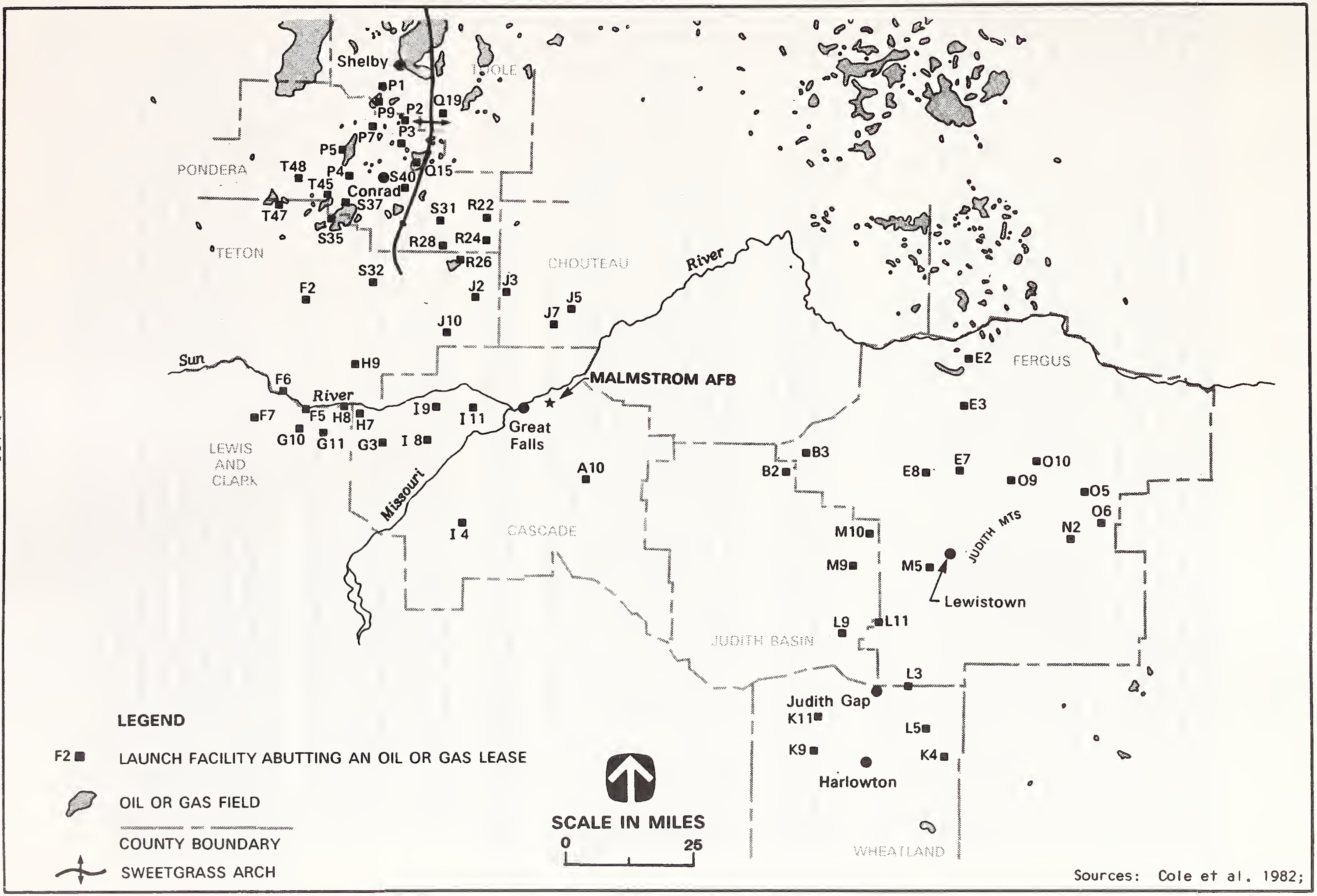

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FIGURE 3.10.3-5 OIL AND GAS RESOURCES AND LEASING DATA FOR THE MALMSTROM AFB DEPLOYMENT AREA

Mountains in the Judith River Formation. The coal beds of this Cretaceous-age formation are generally less than 2 feet thick and not considered mineable at the present time. Northern Fergus County is underlain by 2.5 to 7-foot-thick Jurassic-age beds of subbituminous coal; however, only two small areas near Winifred and near the confluence of the Judith and Missouri rivers are considered mineable at present. The Great Falls coal field was the major coal-producing area of Montana from the late nineteenth century to 1947, when its main market, the railroad industry, converted to diesel power. The Lewistown field also experienced a brief coal production boom during this period. There is no current production from either of these fields, though areas just south of Great Falls and east of Lewistown contain subsurface mineable coal reserves and active leases. There are no proven strippable coal reserves within the ROI. The majority of the state's production is from the Powder River and Williston basins in eastern Montana. Production of coal in the region is not expected to vary much from present levels in the foreseeable future.

3.10.3.3 Soil Erosion

Most soils in the ROI have moderate or low inherent susceptibilities to wind erosion with erosion expected to exceed the maximum tolerable soil loss on unvegetated ground. Soils with high susceptibilities to sheet erosion near launch facilities occur primarily north and west of Great Falls.

Wind Erosion. Wind erosion of unvegetated ground (e.g., fallow fields) in the ROI is a major concern of the SCS in Montana. The prevailing winds in the ROI are from the southwest; consequently, long tracts of barren ground (e.g., croplands, fallow ground, and construction sites) with a southwest-northeast orientation are the most susceptible to wind erosion. Baseline wind erosion susceptibility of soils in the ROI was categorized based on the Wind Erosion Group (WEG) designation assigned to each soil by the SCS. Soils in WEGs 1 and 2 have high natural susceptibilities to wind erosion with soils in WEGs 3 and 4 having moderate susceptibilities. Those WEG designations greater than 4 are assigned low inherent susceptibilities to wind erosion.

None of the soils near the launch facilities have high wind erosion susceptibilities. Moderate susceptibilities are prevalent in the following areas:

- The western portion of the ROI near flights F, G, and H;
- The eastern portion of the deployment area northeast and northwest of Lewistown (flights D, E, and O), as well as near Harlowton (flights K and L); and
- The extreme northwestern portion of the ROI in flight T.

The highest WEG designation at a launch facility was group 3. This WEG designation has been assigned to soils near launch facilities D-11, H-5, H-7, K-9, P-1, and S-33. Soils in WEG 3 have the potential to erode at a rate of 86 tons per acre per year (T/ac/yr) if soil conservation techniques are not implemented. The remainder of the soils at launch facilities are considered to have low inherent susceptibilities to wind erosion. Many areas near launch facilities are used for agricultural croplands and remain fallow for long periods of time. Soils in fallow fields are likely to erode at rates near or in excess of the maximum tolerable soil loss.

Soils along the T/E routes can be reasonably assumed to have wind erosion susceptibilities similar to nearby launch facilities. Consequently, soils adjacent to T/E routes leading to flights D, E, F, G, H, L, O, and T have moderate susceptibilities to wind erosion. Most T/E route segments have wind erosion rates less than the maximum tolerable soil loss due to the natural vegetative cover.

Most soils on the base likely to be disturbed by the proposed program have low to moderate susceptibilities to wind erosion. These soils generally erode at rates well below the maximum tolerable soil losses because of the vegetative cover. Soils of the Hillon series along the drainageway flowing north from the base and the Lawther-Gerber soil association in the extreme eastern portion of the base have the potential to erode at rates in excess of 100 T/ac/yr if the vegetative cover is disturbed; this is due to their locations on slopes of 8 to 45 percent. Barren patches of the Dooley, Gerber, and Lawther soil series, as well as the Gerber-Lawther association, can erode at rates in excess of 10 T/ac/yr. All other soils on the base potentially affected by the proposed program will erode at rates exceeding the maximum tolerable soil loss if their vegetative cover is removed.

Sheet Erosion. Baseline sheet erosion susceptibility of soils in the ROI was categorized based on the K-factor designation assigned to each soil by the SCS. Soils with K-factors greater than 0.42 have high natural susceptibilities to sheet erosion and soils with K-factors from 0.28 to 0.42 have moderate susceptibilities to sheet erosion.

Soils with high susceptibilities to sheet erosion near launch facilities occur primarily north and west of Great Falls. The frequency of launch facilities with high sheet erosion susceptibilities is:

- Flights I, J, P, and Q each contain four launch facilities with high inherent susceptibilities to sheet erosion;
- Flight H has three launch facilities with high susceptibilities; and
- Flights E, G, O, R, and T have two launch facilities with high erosion susceptibilities.

All other flights have only one or no launch facilities with high erosion susceptibilities. In general, most launch facilities in the ROI have moderate sheet erosion susceptibilities.

Soils along the T/E routes can be reasonably assumed to have sheet erosion susceptibilities similar to nearby launch facilities. Consequently, soils adjacent to T/E routes leading to flights E, G, H, I, J, P, Q, R, S, and T have the highest susceptibilities to sheet erosion. Most T/E route segments have sheet erosion rates less than the maximum tolerable soil loss due to the natural vegetative cover.

Most soils on the base likely to be disturbed by the proposed program have moderate susceptibilities to sheet erosion. These soils generally erode at rates below the maximum tolerable soil losses because of the vegetative cover. Soils of the Hillon series along the drainageway flowing north from the base have the potential to erode at rates in excess of 100 T/ac/yr if the vegetative cover is disturbed because of their locations on slopes of 8 to 45 percent. Soils in the Gerber-Lawther and Lawther-Gerber associations possess characteristics indicating potential for erosion rates in excess of 10 T/ac/yr if the vegetative cover is removed. The Acel, Dooley, and Lawther soil series are expected to erode at rates of 2 to 3 T/ac/yr without vegetative cover or soil conservation management practices.

3.11 Air Quality

The proposed construction and operations of the Small Intercontinental Ballistic Missile (ICBM) system in Montana may result in the emission of various air contaminants in the vicinity of Great Falls, Montana and in the deployment area. Air quality regulations applicable to the proposed program are established by the U.S. Environmental Protection Agency (EPA) according to the Clean Air Act of 1970. The air quality resource baseline descriptions describe general conditions in the deployment area.

3.11.1 Resource Description

Air quality can be defined by health and welfare-related pollutant effects, quantitative measures of the amount of certain pollutants in the air, or related aesthetic concerns such as visibility. Both short-term weather fluctuations and long-term climatic factors that control pollution dispersion conditions and affect concentration levels are considered part of the air quality resource. Physical effects of ambient air quality within an area depends on the characteristics of the receptors and the type, amount, and duration of exposure. Air quality standards specify upper limits of concentrations and duration of exposure to pollutants in the ambient air which are consistent with the national goal of preventing harmful effects.

Air quality as discussed in this analysis is basically the same as that described in the Legislative Environmental Impact Statement (LEIS). However, the analysis for this Environmental Impact Statement (EIS) differs in that it is site-specific. In addition, detailed data were acquired and modeling was also conducted for Air Quality Analysis.

3.11.2 General Analysis Methodology

3.11.2.1 Region of Influence

The Region of Influence (ROI) includes numerous areas where air quality may be affected directly (by construction activities) or indirectly (by program-induced transportation traffic and housing development). The ROI centers on Malmstrom Air Force Base (AFB), the City of Great Falls, adjacent interstate highways, and principal traffic arterials. The ROI also includes the deployment area, launch facilities, and access roads. In addition, the ROI includes federal and state-mandated areas of study such as federal Prevention of Significant Deterioration (PSD) Class I areas (Bob Marshall, Scapegoat, and Gates of the Mountains wildernesses; U.L. Bend National Wilderness; and Glacier National Park) and the Great Falls nonattainment area for carbon monoxide (CO) and total suspended particulates (TSP). The ROI for air quality is shown in Figure 3.11.2-1.

The ROI for air quality as discussed in this analysis does not differ from that used in the LEIS.

3.11.2.2 Methodology

Climatological data were obtained from the National Climatic Center in Asheville, North Carolina. Data on severe storms and dispersion meteorology were obtained from the EPA and National Weather Service publications.

Ambient air quality data for Great Falls and the deployment area (where applicable) were obtained from the Montana Air Quality Data and Information Summary for 1985 (prepared by the Montana Air Quality Bureau, Helena), which summarizes the air quality from various regions in the state.

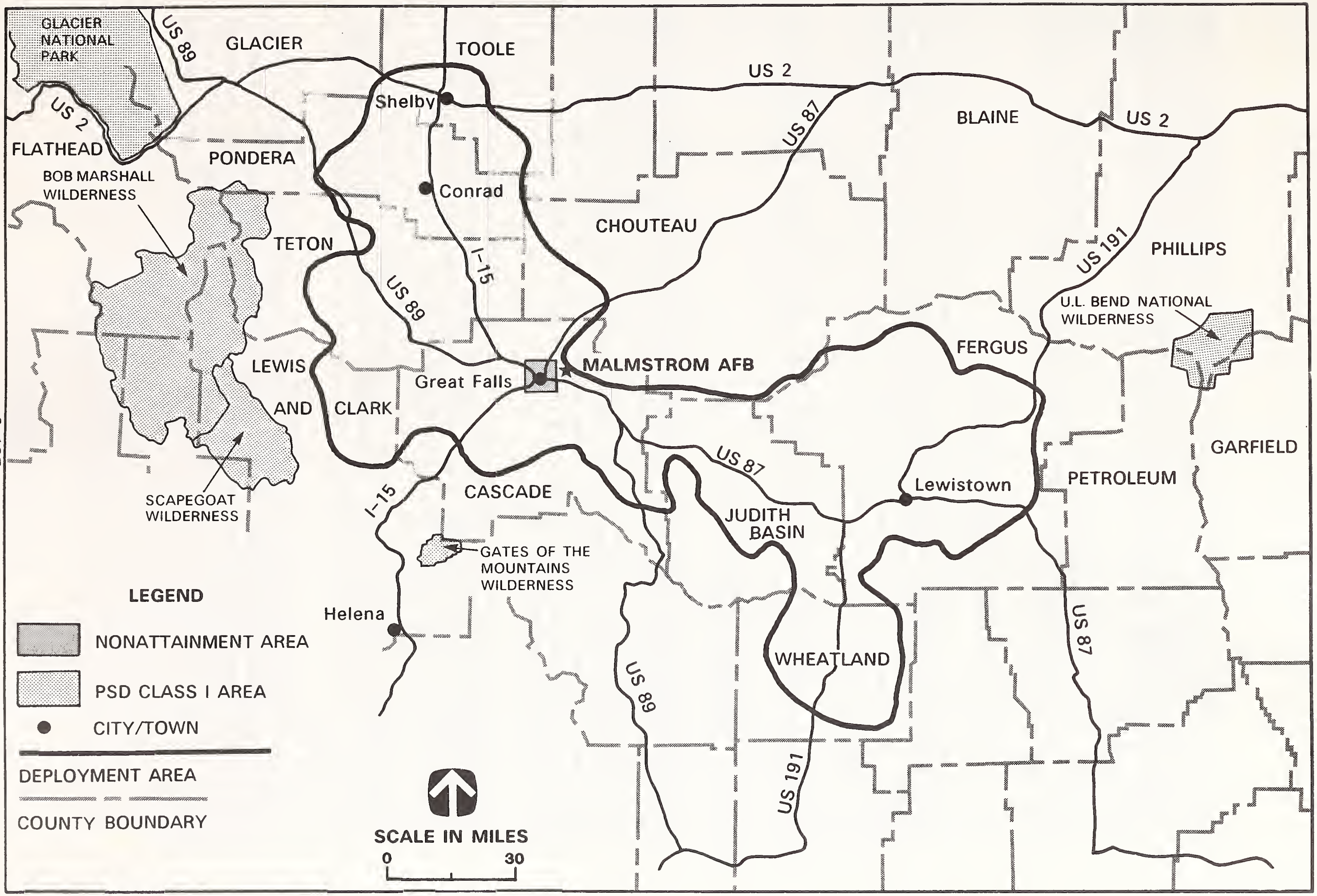

FIGURE 3.11.2-1 REGION OF INFLUENCE FOR AIR QUALITY

Information regarding the location and nature of all significant point sources was obtained from the Montana State Air Pollution Agency. This information is collected by the individual states and reported to the EPA National Emissions Data Systems (NEDS). The NEDS is operated by the EPA to provide current information on air pollution sources and their emissions.

In addition, key roadway segments in the program area were selected to determine vehicular CO concentrations. The CO values were determined using MOBILE-3 emission factors and the CALINE-3 model.

3.11.3 Existing and Future Baseline Conditions

The characterization of the baseline atmospheric environment includes an evaluation of climatology and meteorology, ambient air quality, and applicable rules, regulations, and standards for the program. In general, the baseline data presented serve as a reference point used to assess program-related impacts for which a discussion of climatology and meteorology is important. This is done in order to evaluate pollutant dispersion, describe ambient air quality, and to characterize existing pollutant levels so that comparisons with program-related emission increments can be made. In addition, a review of applicable air quality regulations is made to assist in determining if violations of standards are likely to occur or if mitigation measures and/or emission offsets will be necessary.

3.11.3.1 Climatology and Meteorology

The surface meteorological data collected by the National Weather Service at Great Falls International Airport are considered representative of the deployment area. The Great Falls region and the deployment area are situated in the lee (or dry, eastern side) of the Rocky Mountains. The climate of the area is a modified semiarid continental type. Precipitation varies considerably during the year; the mean annual precipitation is approximately 15 inches. In the winter months precipitation is light (less than 1 inch per month) and usually results from fast-moving Pacific weather systems. The heaviest precipitation falls during May and June.

The prevailing winds are from the southwest. Average surface winds are quite high, averaging about 13 miles per hour (mph). The area is subject to gusting winds which can exceed 60 mph 1 or 2 days per year. Great Falls averages about 25 thunderstorm days per year with the majority occurring between May and August.

At Great Falls, the recorded monthly mean temperature ranges from 69°F in July to about 21°F in January. The area experiences about 24 days per year with maximum temperatures exceeding 90°F and about 42 days per year with minimum temperatures of 0°F or below.

The climate during the winter months is dominated by Arctic high pressure systems, resulting in occasional strong surface-based inversions. The region is subject to Chinook winds, occurring approximately once a week during the winter. A Chinook is a warm, gusty, dry wind which descends on lee sides of mountain ranges. Occasionally each winter, warmer Chinook winds override a shallow layer of cooler air, thus trapping pollutants and causing temporary high levels of air pollution in local areas.

3.11.3.2 Air Quality Regulations

The area that may be affected by air emissions from the proposed program includes three Air Quality Control Regions (AQCRs), the Great Falls Intrastate (No. 141), the Billings Intrastate (No. 140), and the Helena Intrastate (No. 142). The ambient air quality within these regions depends on the extent and orientation of emission sources and the characteristics of the receptors, as well as the time of exposure to a given pollutant. National Ambient Air Quality Standards (NAAQS) have been set by the EPA as mandated in the Clean Air Act of 1970. The standards define levels of air quality that are necessary, with an adequate margin of safety, to protect the public health (primary standards) and the public welfare (secondary standards). Standards exist for sulfur oxides (measured as sulfur dioxide [SO_2]), nitrogen dioxide (NO_2), CO, TSP, lead, and ozone. State and local governments have the authority to impose standards which are more strict than the NAAQS. Montana has amended the national standards to make their own standards more stringent for ozone, SO_2, CO, and TSP. The NAAQS and the ambient air quality standards for the State of Montana are shown in Table 3.11.3-1.

3.11.3.3 Ambient Air Quality

Malmstrom AFB and the deployment area fall within nine counties: Cascade, Chouteau, Fergus, Judith Basin, Lewis and Clark, Pondera, Teton, Toole, and Wheatland. The closest nonattainment area from Malmstrom AFB is Great Falls. Portions of Great Falls were designated as nonattainment for the secondary TSP standard and the 8-hour CO standard. A corridor along 10th Avenue South was declared a nonattainment area for CO on the assumption that the violations were due to the high level of traffic along the route. An analysis by the Montana Air Quality Bureau for CO levels and traffic counts for violation days showed high readings were present during early morning hours when traffic was extremely light. It was concluded that, occasionally each winter, the high CO levels were caused by the effects of warmer Chinook winds overriding a shallow layer of cooler air, thus trapping pollutants. The trapped air would then be confined to river valley zones and would persist for the longest time in the lower areas close to the rivers. Therefore, the CO levels on those days with significant trapping were caused by the concentrations of all CO emissions over the entire city. The City of Great Falls has submitted a plan to the EPA for redesignation. On final approval of the plan, a 2-year monitoring program will begin. If no violations occur within this period, the area will be redesignated to attainment status, probably in early 1989. The Great Falls downtown area has not achieved the federal secondary standard for TSP, and is designated nonattainment for TSP. The entire State of Montana, except where designated as a PSD Class I area, is a Class II area. The Class I areas in the ROI include the Bob Marshall, Scapegoat, and Gates of the Mountains wildernesses; U.L. Bend National Wilderness; and Glacier National Park.

In general, air quality in the rest of the deployment area is excellent. This results from a number of factors, including the rural character and the meteorological and topographical features of the area. The sparse population, combined with large amounts of undeveloped land, few large pollutant emission sources, and the sparsely vegetated terrain which is relatively flat and swept by the east slope winds of the Rocky Mountains, are the major reasons for the excellent air quality.

Ambient air quality at Malmstrom AFB has not been monitored. However, ambient concentrations of specific pollutants have been monitored at a number of locations in Great Falls (Figure 3.11.3-2), 2 miles from Malmstrom AFB. The TSP measurements were also available from the Teton Monitoring Station in Chouteau County. Only TSP

Table 3.11.3-1

Montana and National Ambient Air Quality Standards

Pollutant	Montana Standard	Federal Primary Standard	Federal Secondary Standard
Total Suspended Particulates	75 $\mu g/m^3$ annual average 200 $\mu g/m^3$ 24-hr average[1]	75 $\mu g/m^3$ annual geometric mean 260 $\mu g/m^3$ 24-hr average[1]	60 $\mu g/m^3$ annual geometric mean 150 $\mu g/m^3$ 24-hr average[1]
Sulfur Dioxide	52 $\mu g/m^3$ (0.02 ppm) annual average 260 $\mu g/m^3$ (0.10 ppm) 24-hr average[1] 1,300 $\mu g/m^3$ (0.50 ppm) 1-hr average[2]	80 $\mu g/m^3$ (0.03 ppm) annual average 365 $\mu g/m^3$ (0.14 ppm) 24-hr average[1]	1,300 $\mu g/m^3$ (0.5 ppm) 3-hour[1]
Carbon Monoxide	10,000 $\mu g/m^3$ (9 ppm) 8-hr average[1] 26,285 $\mu g/m^3$ (23 ppm) hourly average[1]	10,000 $\mu g/m^3$ (9 ppm) 8-hr average[1] 40,000 $\mu g/m^3$ (35 ppm) 1-hr average[1]	10,000 $\mu g/m^3$ (9 ppm) 8-hr average[1]
Nitrogen Dioxide	100 $\mu g/m^3$ (0.05 ppm) annual average	100 $\mu g/m^3$ (0.05 ppm) annual average	100 $\mu g/m^3$ (0.05 ppm) annual average
Photochemical Oxidants (ozone)	195 $\mu g/m^3$ (0.10 ppm) hourly average[1]	235 $\mu g/m^3$ (0.12 ppm) 1-hour average[1]	235 $\mu g/m^3$ (0.12 ppm) 1-hr average[1]
Lead	1.5 $\mu g/m^3$ 90-day average	1.5 $\mu g/m^3$ calendar quarter average	None
Visibility (Applies to PSD mandatory Class I areas)	Particle scattering coefficient of 3×10^{-5} per meter annual average	None	None

Notes: [1]Not to be exceeded more than once per year.
[2]Not to be exceeded more than 18 times per year.
$\mu g/m^3$ = micrograms of pollutant per cubic meter of sampled air.
ppm = parts per million.

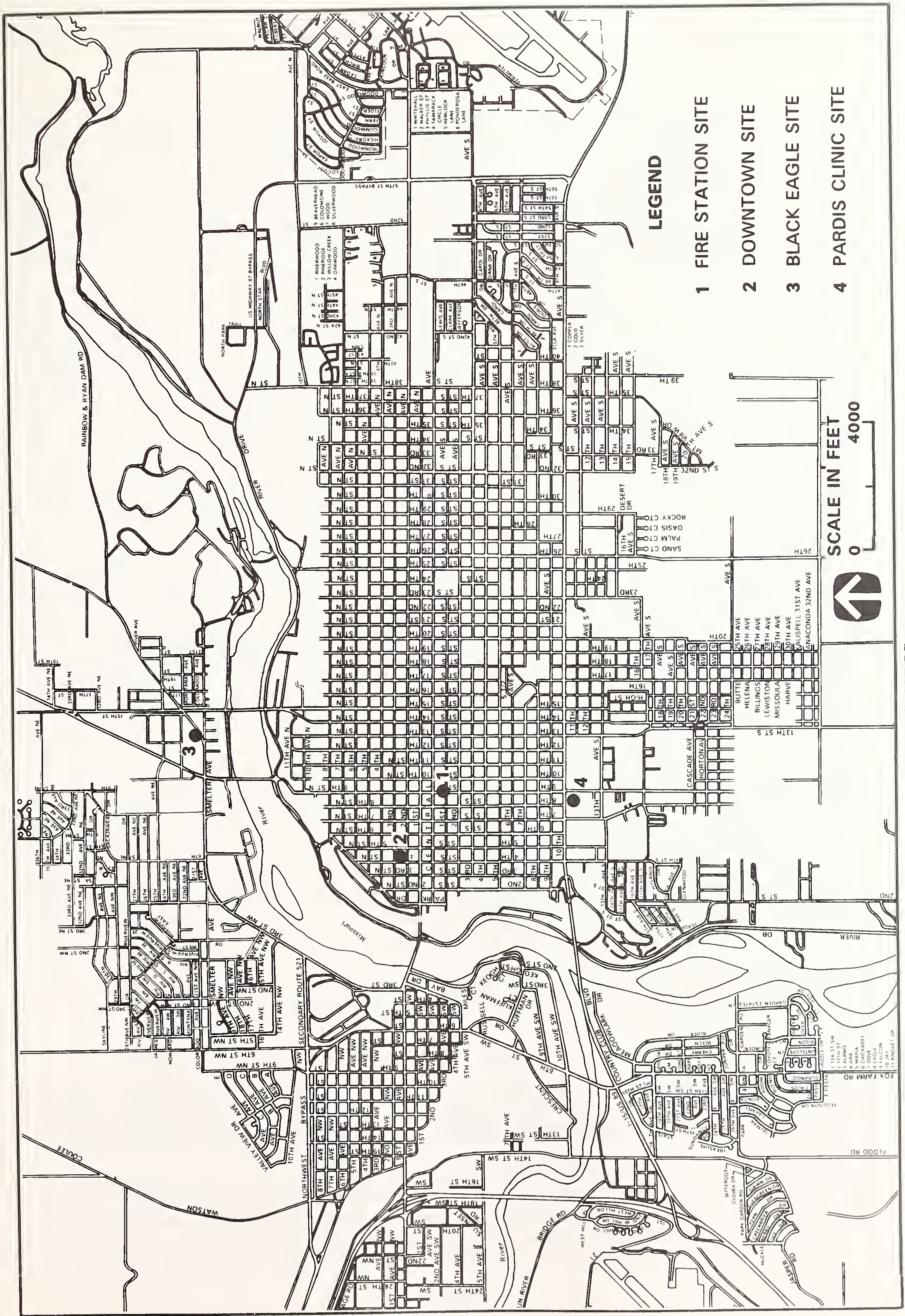

FIGURE 3.11.3-2 GREAT FALLS AIR QUALITY MONITORING SITES

and CO are monitored at Great Falls. No other criteria pollutants are monitored because of the lack of either point or area sources. Table 3.11.3-2 presents selected air quality data from Great Falls and Teton. The 1985 air quality measurements in Great Falls indicate that the maximum 24-hour TSP observation was 264 micrograms per cubic meter ($\mu g/m^3$) at the Fire Station No. 1 site. The highest annual TSP geometric average at the fire station was 65.8 $\mu g/m^3$ and the highest annual arithmetic average was 78.7 $\mu g/m^3$. The maximum 1-hour and 8-hour CO values are 12,333 $\mu g/m^3$ (11.1 parts per million [ppm]) and 9,000 $\mu g/m^3$ (8.1 ppm), respectively; both are within the standards.

Visibility degradation is caused by the light scattering and absorbing effect of fine particulates and certain visible gases such as nitrogen oxides. Visibility monitoring is being conducted in Glacier National Park by the National Park Service. The geometric mean standard visual range at Glacier National Park was about 79 miles for the 1982 summer period. Visibility is normally very good in Montana and will average from 45 to 65 miles over the year. There are very few year-round pollution sources in the vicinity of Malmstrom AFB. The predominance of southwesterly drainage winds across Malmstrom AFB usually vents pollution from the small industrial sites in the area. With the occurrence of forest fires in the nearby mountains from late summer through early fall, accompanied by a favorable upper air flow, visibility can occasionally be reduced to 5 to 7 miles at the base and down to 1 mile near the mountains.

The air quality in the ROI will continue to be good. Some increases in CO emissions are expected because of increased transportation activities resulting from the population growth expected in the City of Great Falls. However, the increase will be minimal and the CO concentration will be lower than baseline conditions because newer model cars will replace older model cars with lower emissions rates, along with the low increase in traffic. The results of the CO assessment for the future baseline for the years 1990 and 2000 at selected roadway segments are shown in Table 3.11.3-3. As noted in this table, no state or federal ambient air quality standards will be violated.

Increases in TSP concentrations are expected in the program area as a result of population growth and nonprogram-related construction. The assessment of these nonprogram-related increases is not possible since the exact time, location, type, and level of construction and operations activities (necessary for quantification of impacts) are not available. The existing urban and rural background concentrations for TSP are conservatively assumed to remain constant in the future. During the past several years, ambient TSP levels have been decreasing even though the population has been increasing. Rural TSP concentrations are primarily a result of natural sources and agricultural activities, which are expected to remain relatively constant.

It is assumed that the visual range will remain unchanged in the deployment area and will average from 45 to 65 miles. This is due to the lack of additional large point sources.

3.11.3.4 Emissions

The latest annual (1986) regional air quality emissions inventory, extracted from the EPA NEDS, is provided in Table 3.11.3-4. Emissions data were available for TSP, sulfur oxides, nitrogen oxides, CO, and volatile organic compounds, a measure of hydrocarbons.

The data include the four most important source categories, namely fuel combustion in stationary sources, transportation, solid waste disposal, and industrial processes, as well as a fifth source category, miscellaneous. Stationary fuel combustion sources include both area and point sources of fuel used for heat and power in residences, industries,

Table 3.11.3-2

Air Quality Monitoring Data Within the Region of Influence for Malmstrom AFB and the Deployment Area

TOTAL SUSPENDED PARTICULATES (μg/m³)

County and City	Site Location	Annual Geometric Mean	24-hr Average Max.	24-hr Average 2nd High	No. of Exceedances of 24-hr Standards: Federal Primary	Federal Secondary	State
Cascade							
Great Falls	Fire Station No. 1	65.8	264	225	1	5	3
	Downtown	45.6	169	125	0	1	0
	Downtown (Collocated)	43.1	172	122	0	1	0
	Black Eagle Post Office	52.6	225	204	0	3	2
Teton							
Choteau	Circle 8 Ranch	13.5	41	36	0	0	0

Federal Standards (μg/m³):	Annual Geometric Mean	24-hr Average
Primary	75	260[1]
Secondary	60	150[1]
Montana Standards (μg/m³):	75	200[1]

CARBON MONOXIDE (μg/m³)

County and City	Site Location	1-hr Average Max.	1-hr Average 2nd High	8-hr Mean Max.	No. of Exceedances of 8-hr Standard: Days	Times
Cascade						
Great Falls	Pardis Clinic	12,333 (11.1)[2]	12,000 (10.8)	9,000 (8.1)	0	0

Federal Standards (μg):	1-hr Average	8-hr Average
(Primary and Secondary)	40,000[1] (35)	10,000 (9)
Montana Standards (μg):	26,285 (23)	10,000 (9)

Notes: [1]Not to be exceeded more than once per year.
[2]Numbers in parentheses are measured in parts per million (ppm).

Source: Montana Department of Health and Environmental Sciences 1986b.

Table 3.11.3-3

Predicted Baseline Carbon Monoxide Concentrations at Selected Receptors for the Years 1985, 1990, and 2000

Roadway Segment	Averaging Time	1985 (ppm)	1990 (ppm)	2000 (ppm)
Great Falls, Montana				
87/89 Highway				
Between 57th Street and South Gate of Malmstrom AFB	1-hour	2.4	2.2	2.1
	8-hour	0.7	0.7	0.6
57th Street				
Between 2nd Avenue North and 10th Avenue North	1-hour	2.7	2.5	2.3
	8-hour	0.8	0.7	0.7
10th Avenue North				
Between 57th Street and Commercial Gate	1-hour	2.8	2.7	2.5
	8-hour	0.8	0.8	0.7
2nd Avenue North				
Between 38th and 57th Streets	1-hour	4.7	4.4	3.9
	8-hour	1.3	1.2	1.1
Between 57th Street and Malmstrom AFB Main Gate	1-hour	6.9	6.3	5.4
	8-hour	1.7	1.6	1.4

institutions, and commercial buildings. The transportation category includes automobiles, trucks, buses, aircraft, trains, and other vehicles. Solid waste disposal emissions include those from all sources of open burning and incineration, while emissions from industrial processes include only those industrial air pollutants emitted during the manufacturing process. Miscellaneous emission types vary according to the region involved, but most commonly include fugitive dust, solvent evaporation, agricultural burning, forest fires, and structural fires.

Based on the air quality inventory, emissions of nitrogen oxides, CO, and hydrocarbons are derived primarily from transportation-related sources. Evaporation of petroleum products and solvents is an additional source of hydrocarbons. Electrical generation is an additional source of nitrogen oxides. Sulfur oxide emissions are primarily from coal and oil combustion and petroleum industry processes. Emissions of TSP occur primarily as fugitive dust resulting from vehicular traffic on unpaved roads. Existing major point sources of air pollutants include the Montana Refining Company, GTA Feed Company, and Congra Feed Mill, all located in Great Falls. Future baseline regional emissions will increase due to normal population and industrial growth but these increases will be minimal because of the low growth potential in these areas.

Table 3.11.3-4

Regional Air Quality Inventory
1986

County	Fuel Combustion					Industrial Process					Solid Waste Disposal				
	TSP	SO_x	NO_x	VOC[1]	CO	TSP	SO_x	NO_x	VOC[1]	CO	TSP	SO_x	NO_x	VOC[1]	CO
Cascade	108	393	475	214	654	15	1,012	67	1,016	874	86	1	3	241	722
Chouteau	0	8	12	12	0	N/A[2]	N/A	N/A	N/A	N/A	59	2	13	88	276
Fergus	36	23	52	74	226	N/A	N/A	N/A	N/A	N/A	39	1	7	73	227
Judith Basin	0	9	4	0	3	N/A	N/A	N/A	N/A	N/A	26	1	6	37	119
Lewis and Clark	247	141	350	501	1,480	644	26,197	0	0	36,054	35	1	1	99	296
Pondera	125	6	24	265	773	N/A	N/A	N/A	N/A	N/A	23	1	4	41	127
Teton	0	8	12	0	3	N/A	N/A	N/A	N/A	N/A	41	1	9	66	205
Toole	0	6	12	0	3	0	388	0	0	0	30	1	6	49	152
Wheatland	0	1	7	0	3	N/A	N/A	N/A	N/A	N/A	14	0	3	22	68

Emission Source (T/Yr)

County	Air/Water Transportation					Land Transportation					Miscellaneous Primary Fugitive Dust				
	TSP	SO_x	NO_x	VOC[1]	CO	TSP	SO_x	NO_x	VOC[1]	CO	TSP	SO_x	NO_x	VOC[1]	CO
Cascade	43	8	69	96	444	2,834	420	4,636	4,780	37,661	28,901	4	103	1,670	3,626
Chouteau	1	0	3	16	186	142	58	492	368	1,883	29,272	6	153	805	5,355
Fergus	1	1	4	21	273	433	100	1,067	1,116	9,496	20,565	6	168	956	5,879
Judith Basin	0	0	1	2	32	65	26	311	244	1,775	10,297	3	71	370	2,500
Lewis and Clark	50	7	62	119	482	1,310	224	2,334	3,288	29,017	23,526	68	1,805	8,333	57,421
Pondera	0	0	2	12	142	237	54	636	715	3,156	9,957	0	13	144	455
Teton	0	0	3	18	141	142	53	619	545	4,025	13,103	1	17	146	595
Toole	0	0	2	16	158	187	42	475	355	2,523	12,215	1	15	265	523
Wheatland	0	0	0	5	26	43	14	175	196	1,473	5,399	2	24	292	1,889

Notes: [1]VOC, volatile organic compounds, are a measure of reactive hydrocarbons.
[2]N/A Not applicable.

Source: U.S. Environmental Protection Agency 1986.

3.12 Noise

Construction and deployment of the Small Intercontinental Ballistic Missile (ICBM) system would result in potential noise-level increases in and around construction sites, and also along traffic corridors in the area. Noise sources include construction equipment and the vehicles used to transport workers and materials to the sites. Construction activities that produce noise include those associated with the building of support facilities and residential housing onbase and with the building of Hard Mobile Launcher (HML) facilities in the deployment area.

3.12.1 Resource Description

Noise is defined as any unwanted sound, a sound that interferes with speech or hearing, one intense enough to damage hearing, or one that is otherwise annoying. Noise, or sound pressure level (SPL), is usually measured in decibels (dB). The decibel scale is an artificial scale developed to compare one sound pressure to a reference sound pressure. Because humans have varying sensitivity to a wide range of frequencies, a weighting is used and the resultant SPL is known as the A-weighted sound level (dBA).

Reference values have been established for ambient background noise related to urban and industrial activities and threshold levels of noise. Baseline noise values for many study areas are related to traffic and may be determined by monitoring or modeling noise levels within the area. The significance of impacts to the noise environment is a function of community size, time of day, demographics, size of area(s) exposed, frequency of occurrence, and the frequency of the noise, with community and receptor sensitivity being the arbiter as to whether impacts will or will not be significant.

A regional-level noise analysis was presented in the Legislative Environmental Impact Statement (LEIS). In this Environmental Impact Statement (EIS), more site-specific noise data were collected and analyzed, and the Federal Highway Administration's (FHWA) STAMINA 2 model was used to predict traffic noise levels.

3.12.2 General Analysis Methodology

3.12.2.1 Region of Influence

The Region of Influence (ROI) for noise is broadly defined as that part of the proposed program area where program-related noise-level increases may occur. The aggregated noise level is a function of distance, the activity schedule, and heavy construction equipment generating the noise. Sensitive noise receptors identified near program construction zones, such as schools, hospitals, parks, and churches that will be affected by increased noise levels, are also included in the ROI as shown in Figure 3.12.2-1.

The noise ROI centers on Malmstrom Air Force Base (AFB), the City of Great Falls, and principal traffic arterials. The ROI also consists of the deployment area and launch facilities where program construction may take place, and includes Cascade, Chouteau, Fergus, Judith Basin, Lewis and Clark, Pondera, Teton, Toole, and Wheatland counties, Montana.

The ROI for noise is the same as that used for the LEIS.

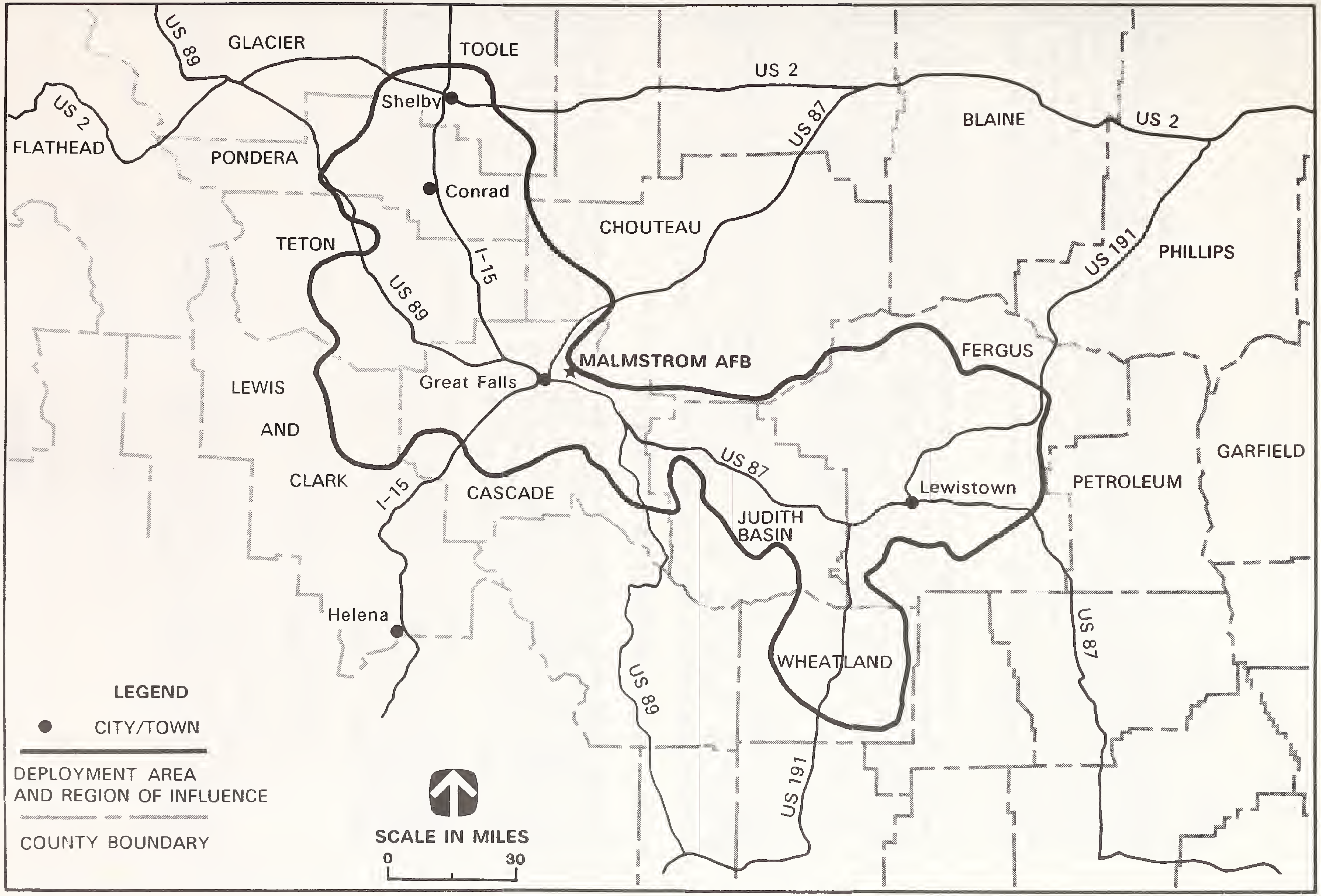

FIGURE 3.12.2-1 REGION OF INFLUENCE FOR NOISE

EM3-NO/2

3.12.2.2 Methodology

Sound levels vary over time at any location; a single number cannot provide a complete description of the SPL at the location. In most urban locations, it is quieter at night than during the day when there are variations in noise levels due to passing traffic and other events. To take account of these fluctuations, the statistical distribution of noise levels with time is considered. The current methodology for describing the statistical characteristics of community noise-level fluctuations focuses on the percent of exceedance of designated levels. Noise-exceedance levels are denoted by L_{10}, L_{50}, L_{90}, and so on, where, for example, L_{50} is the median SPL which is exceeded 50 percent of the reference time period.

In addition to these statistical measures, environmental noise can be characterized by average noise levels such as L_{eq}, the energy-equivalent continuous noise levels. The L_{eq} can be averaged over a 24-hour period, or, for specific applications such as schools, can be averaged over a particular portion of the day. The daytime noise level L_d refers to noise between 7:00 A.M. and 7:00 P.M. The L_{dn} represents the day/night equivalent noise level that incorporates a 10-dB penalty for nighttime noise between 10:00 P.M. and 7:00 A.M. to reflect the added likelihood of annoyance during this nighttime period.

Baseline noise levels were measured in and around Malmstrom AFB and the City of Great Falls (at sensitive noise receptor locations, near highways, and other strategic places) to characterize the existing noise environment (Tables 3.12.3-1, 3.12.3-2, and Figure 3.12.3-1). Noise levels in the deployment area were not measured but were estimated using available noise level data for this type of background environment.

3.12.3 Existing and Future Baseline Conditions

The major noise sources in the vicinity of Malmstrom AFB are local highways, onbase flying missions, and rotary wing air traffic. The major sources of motor vehicle-related noise at Malmstrom AFB are the 57th Street (U.S. 87) Bypass, 2nd Avenue North, 10th Avenue South, 10th Avenue North, and primary and secondary streets within the base. Since road traffic is the major source of noise impacts in the area, the baseline study was conducted as a traffic noise investigation.

Background noise monitoring was conducted from October 20 to 25, 1986, at ten sites (Table 3.12.3-1) in and around Malmstrom AFB to obtain a representative measure of the existing sound levels. Of the ten sites, four were located onbase and six were located offbase (Figure 3.12.3-1). Twenty-four hour noise monitoring was performed close to the following types of receptors:

- Critical noise-sensitive sites such as schools, hospitals, or churches on or near major thoroughfares; and
- Residential areas.

The results of the background sound-level survey are summarized in Table 3.12.3-2 which represents the A-weighted L_{10}, L_{50}, L_{90}, L_{eq}, and L_{dn} sound levels of each sampling location for the time span indicated.

Table 3.12.3-1

Noise Monitoring Sites In and Around Malmstrom AFB[1]

1. North Boundary of the Base (South of Proposed Construction)
2. Loy School
3. Inside the Base Main Gate
4. Near the Base Hospital (Corner of Avenue C and 5th Street)
5. 2nd Avenue North and 57th Street
6. 47th Street and 10th Avenue South
7. Municipal Golf Course (on River Drive)
8. Base Educational Center (Avenue C and 5th Street)
9. 2nd Avenue North (Between 52nd and 57th Street)
10. U.S. 87 Bypass Road (Residential Area)

Note: [1]See Figure 3.12.3-1 for monitoring locations.

Table 3.12.3-2

Malmstrom AFB Noise Monitoring Study

Site[1]	Measurement Period[2]	L_{eq} (dBA)	L_{dn} (dBA)	L_{90} (dBA)	L_{50} (dBA)	L_{10} (dBA)
No. 1	6:00 A.M.- 7:00 P.M.	51.4	N/C[3]	46.6	51.2	57.2
No. 2	6:00 A.M.- 6:00 A.M.	52.1	55.7	40.8	54.2	58.8
No. 3	6:00 A.M.- 6:00 A.M.	52.2	55.8	42.4	53.6	58.8
No. 4	6:00 A.M.- 6:00 A.M.	50.7	54.2	40.0	52.4	57.6
No. 5	6:00 A.M.-12:00 A.M.	59.2	60.9	53.6	60.0	63.2
No. 6	7:00 A.M.- 6:00 A.M.	53.9	57.4	43.2	55.6	59.6
No. 7	7:00 A.M.- 4:00 A.M.	57.7	60.6	50.4	58.4	64.0
No. 8	6:00 A.M.- 2:00 A.M.	51.0	53.3	44.0	51.2	56.8
No. 9	6:00 A.M.- 6:00 A.M.	54.3	58.0	42.4	56.0	60.8
No. 10	6:00 A.M.- 6:00 A.M.	56.2	60.0	43.6	58.8	63.2

Note: [1]See Figure 3.12.3-1 for monitoring locations.
[2]Measurement period span is rounded to nearest hour.
[3]Not calculative.

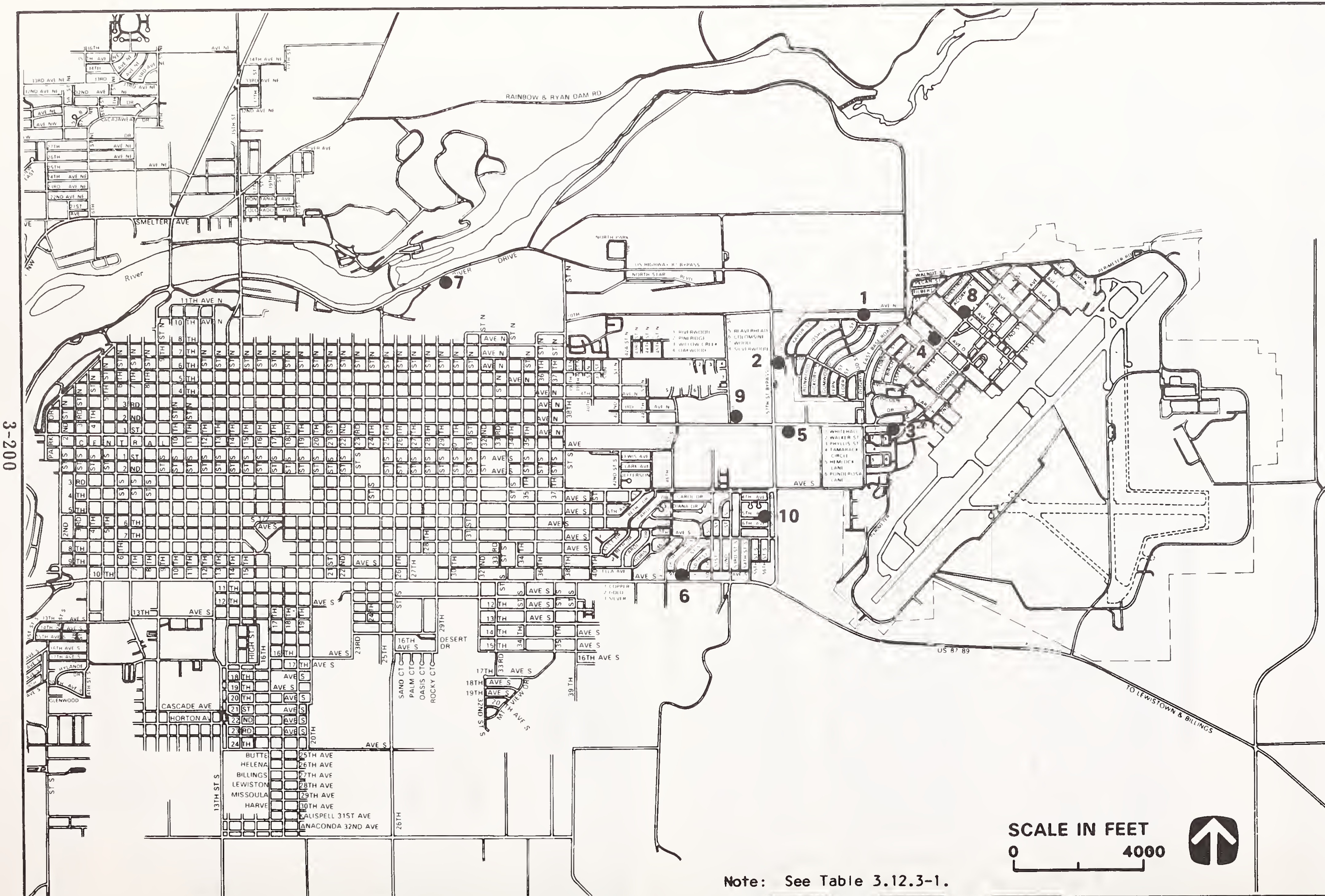

FIGURE 3.12.3-1 NOISE MONITORING SITES IN AND AROUND MALMSTROM AFB

EM3-NO/1

The noise measurement area is primarily zoned for commercial, light industrial, and agricultural use. It consists primarily of Air Force multiple-family residences on Malmstrom AFB, a few small apartment buildings on U.S. 87 Bypass, and an elementary school. The noise environment during daytime hours was dominated by local street traffic-generated noise peaks, with distant traffic noise and occasional aircraft overflights near the base, especially the KC-135R air refueling mission stationed at Malmstrom AFB during the first 3 days of monitoring. Therefore, representative KC-135R aircraft noise was included in the baseline noise measurements. The Malmstrom AFB Air Installation Compatible Use Zone (AICUZ) report was released in 1978 based on EB-57 aircraft assigned to the base at that time. The Great Falls County Planning Board has recommended that this 1978 AICUZ report remain in effect until the more current Malmstrom AFB KC-135R AICUZ report is completed. However, it can be pointed out that the new AICUZ noise contours will be compressed due to the quieter KC-135R aircraft. Other noise measurement sites are located near highways and local streets. Monitoring Sites No. 5 (2nd Avenue and 57th Street) and No. 10 (U.S. 87 Bypass Road) are heavily traveled and show high L_{eq} and L_{dn} values. Even though Site No. 7 (the municipal golf course on River Drive) shows high L_{eq} and L_{dn} values, these are attributed to the constant noise from a nearby hydroelectric generation facility on the Missouri River and occasional heavy trucks on the street. The FHWA has established a maximum noise abatement level of 65 dBA from highways for the land use (receptor) activity category that includes parks, residences, and schools. The measured L_{eq} from the Great Falls and Malmstrom AFB monitoring sites are within this standard.

The surrounding deployment area is characterized as a basically quiet, sparsely populated, rural environment. Natural noise sources make the major contributions to ambient noise levels in the largely undeveloped deployment area. In many areas, wind is probably the greatest of all noise sources, especially during the spring when wind speeds tend to reach a maximum. Rainstorms also provide limited periods of elevated natural noise. Birds and insects also make contributions to natural ambient noise levels. Outdoor daytime residual noise levels at remote wilderness sites are about 16 dBA, while the same type of noise level would range between 35 and 45 dBA on a farm or in rural areas. Infrequent agricultural operations will increase the ambient levels for short periods throughout the year. Figure 3.12.3-2 depicts the decibel levels (dBA) normally produced by common machines and conditions in the environment.

Estimated daily traffic volumes at selected locations in Great Falls for both existing conditions (1985) and future baseline in the years 1990 and 2000 were used to predict the future noise levels without the program. The results indicate that the greatest increase is less than 1 dBA, which is a minimal increase above existing conditions.

		dBA*	
LETHAL		-180-	
		-175-	
		-170-	
		-165-	
		-160-	
		-155-	
		-150-	
		-145-	
	Sonic Boom	-140-	
		-135-	
THRESHOLD OF PAIN			
		-130-	
	Jet Takeoff at 200'	-125-	
		-120-	
		-115-	Discotheque
PHYSICAL DISCOMFORT	Motorcycle at 20'	-110-	
	Dump Truck	-108-	Jackhammer (Peak)
		-105-	Power Mower
		-104-	Loader
		-100-	
	Freight Train at 50'	-95-	Newspaper Press
	Propeller Plane Fly-Over at 1,000'	-90-	Food Blender
		-85-	Electric Mixer
	Freeway Traffic at 50'	-80-	Washing Machine; Alarm Clock; Garbage Disposal; Electric Can Opener
		-75-	Office with Tabulating Machines
	Average Traffic at 100'	-70-	Vacuum Cleaner; Portable Fan
		-65-	Electric Typewriter at 10'
		-60-	Dishwasher Rinse at 10'; Air Conditioning Unit
		-55-	
		-50-	Normal Conversation at 12'
	Light Traffic at 100'	-45-	Rural Residential Area
		-40-	
		-35-	Library
		-30-	
		-25-	
		-20-	Motion Picture Studio
		-15-	
		-10-	Leaves Rustling
		-5-	
THRESHOLD OF HEARING			
		-0-	

*The unit of sound is the decibel (dB). The loudness of sound is typically measured using a sound meter, the A-scale, which corresponds closely to the way the human ear perceives sound. Therefore, the sound level for noise evaluations is frequently expressed in dBA.

FIGURE 3.12.3-2 SOUND LEVELS OF COMMON EQUIPMENT AND ENVIRONMENTAL CONDITIONS

4.0

4.0 ENVIRONMENTAL CONSEQUENCES

This chapter describes the environmental consequences of proposed deployment and peacetime operation of the Small Intercontinental Ballistic Missile (ICBM) at Malmstrom Air Force Base (AFB), Montana. Impacts are considered for each of the resource categories described in Chapter 3.0, Affected Environment. Impacts are evaluated and rated in terms of their magnitude and significance.

The Council on Environmental Quality (CEQ) regulations state that environmental impact statements (EISs) "shall provide full and fair discussion of significant environmental impacts," and that impacts shall be discussed in proportion to their significance. In addition, the following definition of significance is provided: " 'Significantly' as used in NEPA requires consideration of both context and intensity."

Under the definition of context, the regulations indicate that "significance varies with the setting of the proposed action." Typically, the setting of an impact can be characterized as site, local, or regional. For the proposed Small ICBM program at Malmstrom AFB, site impacts would occur as a result of construction disturbance at the base (including the base expansions for family housing and the Hard Mobile Launcher [HML] vehicle operations training area), at launch facilities, and along the transporter/erector (T/E) route network. Local impacts would occur in the City of Great Falls and other communities where program inmigrants would reside. Regional impacts would occur in basins or airsheds, or county or multiple-county areas. Table 4.0-1 provides a list of the resources and resource elements analyzed in this EIS, and their primary setting. The collective effects of site impacts would vary with the launch facilities selected, whereas the collective effects of local impacts generally would not.

The CEQ definition of context also indicates that "both short- and long-term effects are relevant." For this EIS, both short- and long-duration impacts have been identified. Short-duration impacts are transitory effects of the proposed program that are of limited duration and are generally caused by construction activities or operation start-up. Long-duration impacts would occur over an extended period or time, whether they start during the construction or operations phases. Most impacts from the operations phase are expected to be of long duration since program operations essentially represent a steady-state condition (i.e., impacts resulting from actions that occur repeatedly over a long period of time). However, long-duration impacts can also be caused by construction activities if a resource is destroyed or irreparably damaged, or if the recovery rate of the resource is low.

According to the CEQ regulations (Code of Federal Regulations 1981, 40 CFR 1508.27), intensity "refers to the severity of the impacts." Ten items are listed that "should be considered in evaluating intensity:"

1. Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

2. The degree to which the proposed action affects public health or safety.

3. Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

Table 4.0-1
Primary Setting of Impacts to Resource Elements

Resource and Element	Setting
Socioeconomics	
Economic Base	Local
Demographics	Local
Housing	Local
Public Services	Local
Public Finance	Local
Utilities	
Potable Water Treatment and Distribution	Local
Wastewater	Local
Solid Waste	Local
Energy Utilities	Local
Transportation	
Roads	Local
Public Transportation	Local
Railroads	Local
Airports	Local
Land Use	
Urban Land Use	Local
Rural Land Use	Site
Recreation	
Regional Recreation	Regional
Local Recreation	Local
Visual Resources	Site
Cultural and Paleontological Resources	
Prehistoric Resources	Site
Historic and Architectural Resources	Site
Native American Resources	Site
Paleontological Resources	Site
Biological Resources and Threatened and Endangered Species	
Vegetation	Site
Wildlife	Site
Aquatic Habitats	Site
Unique and Sensitive Habitats	Site
Threatened and Endangered Species	Site
Water Resources	
Water Use	Local
Surface Water Hydrology and Quality	Site/Local/Regional
Groundwater Hydrology and Quality	Site/Local/Regional
Geology and Soils	
Geologic Hazards	Site
Geologic Resources	Site/Regional
Soil Erosion	Site
Air Quality	Local/Regional
Noise	Local

4. The degree to which the effects on the quality of the human environment are likely to be highly controversial.

5. The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

6. The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

7. Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts.

8. The degree to which the action may adversely affect districts, site, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.

9. The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973.

10. Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

It is not anticipated that the proposed program will have impacts with sufficient intensity to threaten the violation of laws as indicated by consideration 10. Nevertheless, this consideration is included in evaluating the significance of impacts to those resources that are protected by environmental laws.

Controversy, referred to in consideration 4, involves disagreement among recognized professionals over environmental impacts or assessment methodologies. Possible controversy over the purpose, need, or desirability of this program was not considered in evaluating the significance of impacts.

A three-phase impact analysis process was used to evaluate environmental consequences of the proposed Small ICBM program. First, the environmental impacts within resource element categories were identified, then the level of the impact (LOI) was evaluated, and finally significance was assessed.

The LOI is a rating (negligible, low, moderate, or high) of the magnitude of an impact. The magnitude has been evaluated in terms of "numbers and kinds" of effects as compared to baseline conditions. The evaluation of LOI is based on both the absolute quantity of an affected resource and the comparisons of this quantity with the resource base. Once the LOI is determined, an evaluation is made as to whether the impact is significant. Significance is determined by evaluating its context and intensity as previously identified. In many cases, high LOIs will be judged to be significant, but not in all instances. For example, the excess capacity of a system may be large enough so that even a moderate or large impact will not be rated as significant.

The LOI and significance of site impacts at Malmstrom AFB and the launch facilities are presented in Figure 4.0-1. For Malmstrom AFB, Figure 4.0-1 identifies impacts within the existing boundaries of the base and the two proposed base expansion areas for military family housing and for HML vehicle operations training. Impacts of other housing options are discussed in text for each affected resource. The assessments of site impacts shown in Figure 4.0-1 are based on the Proposed Action, which would locate two HMLs at each selected launch facility in earth-covered igloos. The conclusions are generally valid for all alternatives except for rural land use impacts. These impacts depend on the extent of the explosive safety zones which in turn depends on the type of HML shelter (igloo or pre-engineered building) and the number of HMLs (1 or 2) at each launch facility. Figure 4.0-2 provides a collective assessment of site impacts along road segments and bridges, compiled by county. These impacts would be the same for all alternatives since the same T/E route network would be used for all alternatives. The LOI and significance of local impacts are presented in matrices throughout this chapter for the appropriate resources identified in Table 4.0-1.

An overall collective summary of LOI and significance was prepared for each resource element. In preparing these assessments, the collective effects of all individual site or local impacts have been considered for the program as whole. It is possible to identify high impacts at some sites and have an overall regional assessment of low or moderate LOI. For the Proposed Action and Alternatives 1 and 2, not all launch facilities would be used; therefore, it is possible to have an overall range of LOI which would depend on the site impacts at launch facilities selected for Small ICBM deployment.

The Proposed Action and the three system alternatives were selected to represent the range of anticipated environmental impacts that would result from the Small ICBM program at Malmstrom AFB. Comparison of all alternatives with the Proposed Action was performed under the assumption that most of the required new military family housing units would be provided onbase. The amount of new military family housing to be constructed would ultimately be determined by a needs study, and may be limited by budget constraints. Therefore, two additional housing options were analyzed to evaluate the full range of consequences resulting from housing Small ICBM inmigrants within the Great Falls urban area. One option (Housing Option H1) provides for partial military family housing onbase; the other (Housing Option H2) assumes that all housing would be provided by the private sector in the Great Falls urban area.

The housing option selected would determine where many of the operations personnel would reside. This, in turn, would have an influence on the socioeconomic and other consequences of the program. The housing options are discussed throughout the Environmental Impact Statement (EIS) in the context of the Proposed Action. The selection of Alternative 2 with no onbase military family housing would lead to an increase in the demand for housing units in the Great Falls community over that analyzed for the Proposed Action with Housing Option H2. For those resource elements that would experience more pronounced effects under Alternative 2 with no onbase military family housing, the differences are discussed. The affected resources and elements are: socioeconomics (housing, education, public services, and public finance), utilities (water treatment and distribution, and wastewater), and transportation (roads).

A discussion of the methodology for evaluating potential impacts is provided for each resource category. The methodology includes procedures for evaluating proposed program impacts, determining LOIs, and determining significance and assumptions and assumed mitigations. Each resource discussion also includes consideration of impacts of the Proposed Action (including housing options), its Alternatives, the No Action

LEVEL OF IMPACT	SIGNIFICANCE: Not Significant	SIGNIFICANCE: Significant
Adverse Impacts		
Negligible	(blank)	
Low	o	•
Moderate	O	●
High	◯	⬤
Beneficial Effects	(shaded)	

Note: Some resource elements may have both beneficial effects and adverse impacts.

SITE IMPACTS FROM MILITARY CONSTRUCTION

SITE / RESOURCE	SHORT DURATION											LONG DURATION														
			BIOLOGICAL						GEOLOGY					CULTURAL				BIOLOGICAL						GEOLOGY		
	LAND USE (RURAL)	VISUAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION	LAND USE (RURAL)	VISUAL	PREHISTORIC	HISTORIC	NATIVE AMERICAN	PALEONTOLOGICAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION
MALMSTROM AFB																										
EXISTING BASE			o	o	O						o				o		•	o	o	o			o			o
NEW HOUSING			o	o							o				o		•	o	o				O			o
HML TRAINING AREA			O	O	o							o		•	o		•	O	O	O			O			⬤
LAUNCH FACILITIES																										
A-2			o	o	◯				o		◯			●			o	o	o	o				o		
A-3	o		o									o		●			o	o								
A-4			o								o			•			o	o								
A-5	O		•		⬤		⬤	◯	o		O	O		•			o	•		O		⬤		o		
A-6	O	O	•	O	⬤		•	◯	o		O	⬤	O	•			o	•	o	O		•		o		
A-7	o	O		O							◯	o	o	•			o		o							
A-8			•	O	O				o		◯	•		•			o	•	o	o				o		
A-9	o			o							o	o		●			●		o							
A-10	o		o						o		◯	o		●			●	o						o	o	
A-11	o		o	O				o	o		◯	o		●			●	o	o					o		
B-2			o						o		◯			●			●	o	o					o	o	
B-3	o			o	●						o	o		●			●		o	o					o	
B-4	o		o		O							o		●			●	o		o						
B-5	o			O								o		•			●		o							
B-6			o	O	o			o	o		◯			●			o	o	o					o		
B-7	o	O										o	o	⬤			●									
B-8	o	O										o	o	●			●									
B-9			o	O	O			o	O		o			⬤			●	o	o	o				O		
B-10	O		•	o					O		◯	O		●			o	•	o					O		
B-11			•	O	o				o		o			⬤			●	•	o					o		
C-2	o								o		o	o		●			o							o		

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Note: All cultural and paleontological resource impacts are assumed to be long duration.

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FIGURE 4.0-1 SITE IMPACTS ASSOCIATED WITH PROPOSED SMALL ICBM MILITARY CONSTRUCTION IN MONTANA

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible		
Low	◦	•
Moderate	○	●
High	◯	⬤
Beneficial Effects		

Note: Some resource elements may have both beneficial effects and adverse impacts.

SITE IMPACTS FROM MILITARY CONSTRUCTION

SITE	SHORT DURATION											LONG DURATION														
			BIOLOGICAL						GEOLOGY					CULTURAL				BIOLOGICAL						GEOLOGY		
RESOURCE	LAND USE (RURAL)	VISUAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION	LAND USE (RURAL)	VISUAL	PREHISTORIC	HISTORIC	NATIVE AMERICAN	PALEONTOLOGICAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION
C-3	◦			◦				◦	◦			◦		⬤			◦		◦					◦		
C-4	◦				◦				◦		○	◦		⬤			◦							◦		
C-5	◦											◦		•			●									
C-6			◦	◦				◦	◦					●	●		●	◦	◦					◦		
C-7			◦	○				◦	◦		◯			⬤			◦	◦	◦					◦		
C-8	○		•	○							◯	○		•			◦	•	◦							
C-9	○		•	○							◯	○		•			●	•	◦							
C-10			•	○	•									●		•	●	•	◦	◦						
C-11	◦	○	•	○	◦				◦			•	◦	⬤			●	◦	◦					◦		
D-2	◦											◦		●			●									
D-3	◦		•						◦			◦		•			●	◦						◦		
D-4	◦				◦				◦		◦	◦		●			◦							◦		
D-5	◦		◦						◦			◦		●			●	◦						◦		
D-6	◦								◦			◦		●	•	•	●							◦		
D-7	◦			○					◯		◯	◦		●		•	◦		◦					◯		
D-8	◦				◦			◦	◦			◦		•			◦							◦		
D-9	◦				◦						◦	•		•		●	◦									
D-10	◦											◦		•			●									
D-11	◦										◦	•		●			●									
E-2	◦		•					◦			○	◦		●	•		●	◦							◦	
E-3					◦							•		•	•		●								◦	
E-4	◦		•		◦						◦	◦		•			●	◦								
E-5	◦		•								◦	◦		•			●	◦								
E-6	◦		◦		◦			◦				◦		●			●	◦								
E-7	◦				◦							◦		•			●								◦	
E-8	◦		•								◦	◦		•			●	•							◦	

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Note: All cultural and paleontological resource impacts are assumed to be long duration.

EM4/1

FIGURE 4.0-1 CONTINUED

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible	□	
Low	o	•
Moderate	O	●
High	◯	⬤
Beneficial Effects	▒	

Note: Some resource elements may have both beneficial effects and adverse impacts.

SITE IMPACTS FROM MILITARY CONSTRUCTION

RESOURCE	SHORT DURATION											LONG DURATION														
			BIOLOGICAL						GEOLOGY					CULTURAL				BIOLOGICAL						GEOLOGY		
SITE	LAND USE (RURAL)	VISUAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION	LAND USE (RURAL)	VISUAL	PREHISTORIC	HISTORIC	NATIVE AMERICAN	PALEONTOLOGICAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION
E-9			o						o		o	•		•	•		●	o						o		
E-10	O		•						o		◯	O		⬤			●	•						o		
E-11	o											o		•	•		●									
F-2			o	O							o			●				o	o						o	
F-3	o		•	o	o		o				o	o		•			●	o	o			o				
F-4	O										O	O		●			●									
F-5			•	O			o	o			o			●			●	o	o			o			o	
F-6	o		o	o	•		o				o	o		●		•	●	o	o	•		o			o	
F-7	o		o	o							o	o		●			●	o	o						o	
F-8			o				o				O			●			●	o				o				
F-9			o	o			o							⬤		⬤	●	o	o			o				
F-10			o	O			o				o			●			⬤	o	o			o				
F-11			•	o	o		o		o		o			⬤			●	o	o			o		o		
G-2		O	o										o	•			●	o								
G-3			o	o					o		o			●		•	o	o	o					o	o	
G-4	o			o					o			o		•			o		o					o		
G-5			o	o					o		◯	•		●	●	•	●	o	o					o		
G-6			•		•		•	o			o			●			●	o		o		•				
G-7			•		•		•	o	o		o			●			•	o		o		•		o		
G-8			•		o		•		o		◯			●			•	o				•		o		
G-9	o		o				•	o	O		◯	o		●			●	o				•		O		
G-10	o							◯			O	o		⬤	•		●								o	
G-11			•		o						o			●			●	o							o	
H-2	o										o	o		•			o									
H-3	o		o						o		O	o		⬤			o	o						o		
H-4	O								O		o	O		●			o							O		

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Note: All cultural and paleontological resource impacts are assumed to be long duration.

EM4/1

IGURE 4.0-1 CONTINUED

LEVEL OF IMPACT	SIGNIFICANCE: Not Significant	SIGNIFICANCE: Significant
Adverse Impacts		
Negligible		
Low	o	•
Moderate	O	●
High	◯	⬤
Beneficial Effects		

Note: Some resource elements may have both beneficial effects and adverse impacts.

SITE IMPACTS FROM MILITARY CONSTRUCTION

RESOURCE / SITE	SHORT DURATION											LONG DURATION														
			BIOLOGICAL						GEOLOGY					CULTURAL				BIOLOGICAL						GEOLOGY		
	LAND USE (RURAL)	VISUAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION	LAND USE (RURAL)	VISUAL	PREHISTORIC	HISTORIC	NATIVE AMERICAN	PALEONTOLOGICAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION
H-5	o		o						O		◯	•		●			o	o						O		
H-6			•						o		◯	•		•			o	o						o		
H-7		O	o					O	o		o		o	●			o	o						o	o	
H-8			o	O				o	o		o			⬤			●	o	o					o	o	
H-9	O											O		●			●								o	
H-10	o		o	O				o	o			o		●	●		●	o	o					o		
H-11	o								o		o	o		•			●							o		
I-2	o		•					o			◯	o		●			●	o								
I-3	o		o	o							o	o		⬤			o	o	o							
I-4			o	o					o		o			●			o	o	o					o	o	
I-5			o	O					o					●			o	o	o					o		
I-6		O	o	o				o					o	⬤			●	o	o							
I-7	o	O	o	o				o	o		o	o	o	●			o	o	o					o		
I-8	o		o		o				o		o	o		●			o	o						o	o	
I-9	o								o			o		●			o							o	o	
I-10	o								o		o	•		●	●		●							o		
I-11	o				o						o	o		●			o								o	
J-2	o										o	o		•			o								o	
J-3	o										o	o		•			o								o	
J-4	o				o						o	o		●			o									
J-5	o											o		•			o								o	
J-6	o										o	⬤		•			o									
J-7	o											o		•	•		o								o	
J-8	o								o			o		•			o							o		
J-9	o		o		•				o			o		•			o	o		o				o		
J-10			o						o		o	•		●			o	o						o	o	

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Note: All cultural and paleontological resource impacts are assumed to be long duration.

FIGURE 4.0-1 CONTINUED

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible	(empty square)	
Low	o	•
Moderate	O	●
High	◯	⬤
Beneficial Effects	(shaded square)	

Note: Some resource elements may have both beneficial effects and adverse impacts.

SITE IMPACTS FROM MILITARY CONSTRUCTION

SITE	SHORT DURATION											LONG DURATION														
			BIOLOGICAL						GEOLOGY					CULTURAL				BIOLOGICAL						GEOLOGY		
RESOURCE	LAND USE (RURAL)	VISUAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION	LAND USE (RURAL)	VISUAL	PREHISTORIC	HISTORIC	NATIVE AMERICAN	PALEONTOLOGICAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION
J-11	o											o		•			o									
K-2	o	O										o	o	●			●									
K-3	o							o	o		o	o		●	•		●							o		
K-4			o		o			o	o		O			⬤			●	o						o	o	
K-5	o											o		●	•		●									
K-6		O	o					o	o		◯		o	⬤			●	o						o		
K-7	o								o		O	o		⬤			o							o		
K-8	O		o						o		o	O		●			●	o						o		
K-9	o										o	o		●			o								o	
K-10	o		o								o	o		●			●	o								
K-11	o							o	o		o	o		●			●							o	o	
L-2	o		o	O			o		O		◯	o		●			o	o	o			o		O		
L-3			•		•		o		o		o			●			●	o		o		o		o	o	
L-4	o						o					o		●			●					o				
L-5	o						o	o	o			o		●			●					o		o	o	
L-6			o				o	O	o					⬤			●	o				o		o		
L-7	o	O					o					o	o	●			●					o				
L-8			o				o				o			●			●	o				o				
L-9	o						o					o		⬤			●					o			o	
L-10	o	O	•		o		o	o	o		o	o	o	⬤	•		●	o				o		o		
L-11	o	O		o			o	o	o			o	o	⬤			●		o			o		o	o	
M-2			•	O	•			o	o		◯	•		●			o	•	o	o				o		
M-3	o		•						O		o	o		●			●	o						O		
M-4	o	O	•	o	o							o	o	●			●	o	o							
M-5	o	O										•	o	⬤			●		o						o	
M-6	o		o	O			o		◯		o	o		●			o	o				o		◯		

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Note: All cultural and paleontological resource impacts are assumed to be long duration.

FIGURE 4.0-1 CONTINUED

EM4/1

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible	□	
Low	○ L	● L
Moderate	○ M	● M
High	○ H	● H
Beneficial Effects	▒	

Note: Some resource elements may have both beneficial effects and adverse impacts.

SITE IMPACTS FROM MILITARY CONSTRUCTION

SHORT DURATION

SITE \ RESOURCE	Land Use (Rural)	Visual	Biological: Vegetation	Biological: Wildlife	Biological: Aquatics	Biological: Unique/Sensitive	Biological: Threatened & Endangered	Surface Water Sedimentation	Geology: Geologic Hazards	Geology: Energy Resources	Geology: Soil Erosion
M-7	○ L	○ M					○ L		○ L		
M-8	○ L		○ L				○ L		○ L		○ L
M-9	○ L	○ M							○ L		○ L
M-10	○ L		● L		○ L			○ L	○ M		
M-11	○ L		● L		○ L			○ M	○ L		
N-2	○ L										○ H
N-3	○ L		○ L	○ M				○ L			○ L
N-4	○ M		● L						○ L		○ L
N-5	○ L								○ L		○ L
N-6	○ M		● L						○ L		○ L
N-7	○ L							○ L	○ L		○ H
N-8	○ L										○ H
N-9			○ L						○ L		○ H
N-10									○ L		○ H
N-11			● L	○ L	○ L			○ L	○ L		○ H
O-2			○ L	○ M	○ L						○ L
O-3	○ L		○ L								○ H
O-4			○ L					○ L			
O-5				○ M					○ L		○ H
O-6			○ L	○ M	○ L						○ L
O-7	○ L		○ L	○ M	○ L				○ L		
O-8	○ L		○ L	○ L					○ L		
O-9			● L	○ M	● L			○ L			
O-10			● L	○ M	○ L			○ L			○ H
O-11			○ L	○ M							○ L
P-1	○ L			○ L							○ L

LONG DURATION

SITE \ RESOURCE	Land Use (Rural)	Visual	Cultural: Prehistoric	Cultural: Historic	Cultural: Native American	Cultural: Paleontological	Biological: Vegetation	Biological: Wildlife	Biological: Aquatics	Biological: Unique/Sensitive	Biological: Threatened & Endangered	Surface Water Sedimentation	Geology: Geologic Hazards	Geology: Energy Resources	Geology: Soil Erosion
M-7	● M	○ L	● H	● M		● M					○ L		○ L		
M-8	○ L		● M			● M	○ L				○ L		○ L		
M-9	○ L	○ L	● M			○ L							○ L	○ L	
M-10	○ L		● H			● M	○ L						○ M	○ L	
M-11	○ L		● M			● M	○ L						○ L		
N-2	● L		● L			○ L								○ L	
N-3	○ L		● H			○ L	○ L	○ L							
N-4	○ M		● M			● M	● L						○ L		
N-5	○ L		● L			● H							○ L		
N-6	○ M		● M			● M	● L						○ L		
N-7	○ L		● H			○ L							○ L		
N-8	● L		● M			● M									
N-9			● M			○ L	○ L						○ L		
N-10			● M			● M							○ L		
N-11			● M		● L	● M	○ L	○ L					○ L		
O-2			● L			● M	○ L	○ L							
O-3	○ L		● L			● M	○ L								
O-4			● L			● M	○ L								
O-5			● L			○ L		○ L					○ L	○ L	
O-6			● L			○ L	○ L	○ L						○ L	
O-7	○ L		● M		● L	● M	○ L	○ L					○ L		
O-8	○ L		● L			● M	○ L	○ L					○ L		
O-9			● L			● M	● L	○ L	○ L					○ L	
O-10			● M			● M	○ L	○ L						○ L	
O-11			● L			● M	○ L	○ L							
P-1	○ L		● M			○ L		○ L						○ L	

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Note: All cultural and paleontological resource impacts are assumed to be long duration.

EM4/1

FIGURE 4.0-1 CONTINUED

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible	☐	
Low	○	•
Moderate	◯	●
High	⭘	⬤
Beneficial Effects	▒	

Note: Some resource elements may have both beneficial effects and adverse impacts.

SITE IMPACTS FROM MILITARY CONSTRUCTION

RESOURCE	SHORT DURATION											LONG DURATION														
			BIOLOGICAL						GEOLOGY					CULTURAL				BIOLOGICAL						GEOLOGY		
SITE	LAND USE (RURAL)	VISUAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION	LAND USE (RURAL)	VISUAL	PREHISTORIC	HISTORIC	NATIVE AMERICAN	PALEONTOLOGICAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION
P-2	○			○					○			○		⬤			○		○					○	○	
P-3	○				○						○	○		●			○								○	
P-4	○			○							○	○		●			•		○						○	
P-5	○			○								○		●			•		○						○	
P-6	○							○				○		●		•	●									
P-7	○								○		⭘	○		⬤			○							○	○	
P-8	○			◯							○	○		●			•		○							
P-9	○	◯		○	○						○	○	○	●			○		○						○	
P-10	○											○		•			○									
Q-11	○			○							○	○		●			○		○							
Q-12	○										○	○		•			○									
Q-13	○											○		•			○									
Q-14	○											○		•			○									
Q-15	○											•		●			○								○	
Q-16	○			○							○	○		•			○		○							
Q-17	○			◯							○	○		•			○		○							
Q-18	○	◯									○	○	○	⬤			○									
Q-19	○			◯								○		●			○		○						○	
Q-20	○	◯						○	○		○	○	○	•			○							○		
R-21	○			○	•				○			○		●			●		○	•				○		
R-22	○		○	○								○		•			○	○	○						○	
R-23	○			○								○		●			○		○							
R-24	○			○	○							○		•			○		○	○					○	
R-25	○											○		●			○									
R-26	○											○		●			●								○	
R-27	○										○	○		•			○									

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Note: All cultural and paleontological resource impacts are assumed to be long duration.

EM4/1

FIGURE 4.0-1 CONTINUED

LEVEL OF IMPACT	SIGNIFICANCE: Not Significant	SIGNIFICANCE: Significant
Adverse Impacts		
Negligible	(empty box)	
Low	○	•
Moderate	◯	●
High	⭘	⬤
Beneficial Effects	(shaded box)	

Note: Some resource elements may have both beneficial effects and adverse impacts.

SITE IMPACTS FROM MILITARY CONSTRUCTION

RESOURCE	SHORT DURATION											LONG DURATION														
			BIOLOGICAL						GEOLOGY					CULTURAL				BIOLOGICAL						GEOLOGY		
SITE	LAND USE (RURAL)	VISUAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION	LAND USE (RURAL)	VISUAL	PREHISTORIC	HISTORIC	NATIVE AMERICAN	PALEONTOLOGICAL	VEGETATION	WILDLIFE	AQUATICS	UNIQUE/SENSITIVE	THREATENED & ENDANGERED	SURFACE WATER SEDIMENTATION	GEOLOGIC HAZARDS	ENERGY RESOURCES	SOIL EROSION
R-28	○			○	○						○	○		•			○		○						○	
R-29	◯							○	○		○	◯		⬤			○							○		
R-30	○				◯						○	○		•			○									
S-31	○				•							○		•			○			•					○	
S-32	○			○							○	○		⬤			○		○						○	
S-33	○											•		●			○									
S-34	○			○								○		•			○		○							
S-35	○							○	○			○		●			○							○	○	
S-36	○								○		○	○		⬤			○							○		
S-37	○		•									○		●			○	○							○	
S-38	○											○		•			○									
S-39	○											○		●			○									
S-40	○											○		•			•								○	
T-41	○			◯								○		⬤		●	●		○							
T-42	○			◯								○		●		•	●		○							
T-43	○			○			○					○		●			●		○			○				
T-44	○			○								○		●			●		○							
T-45	○								○		○	○		⬤			○							○	○	
T-46	○										○	○		•			○									
T-47	○										○	○		⬤		•	○								○	
T-48	○		○								⭘	○		⬤			●	○							○	
T-49	○							○			○	○		⬤			●									
T-50	○			◯			○	○			○	○		●			●		○			○				

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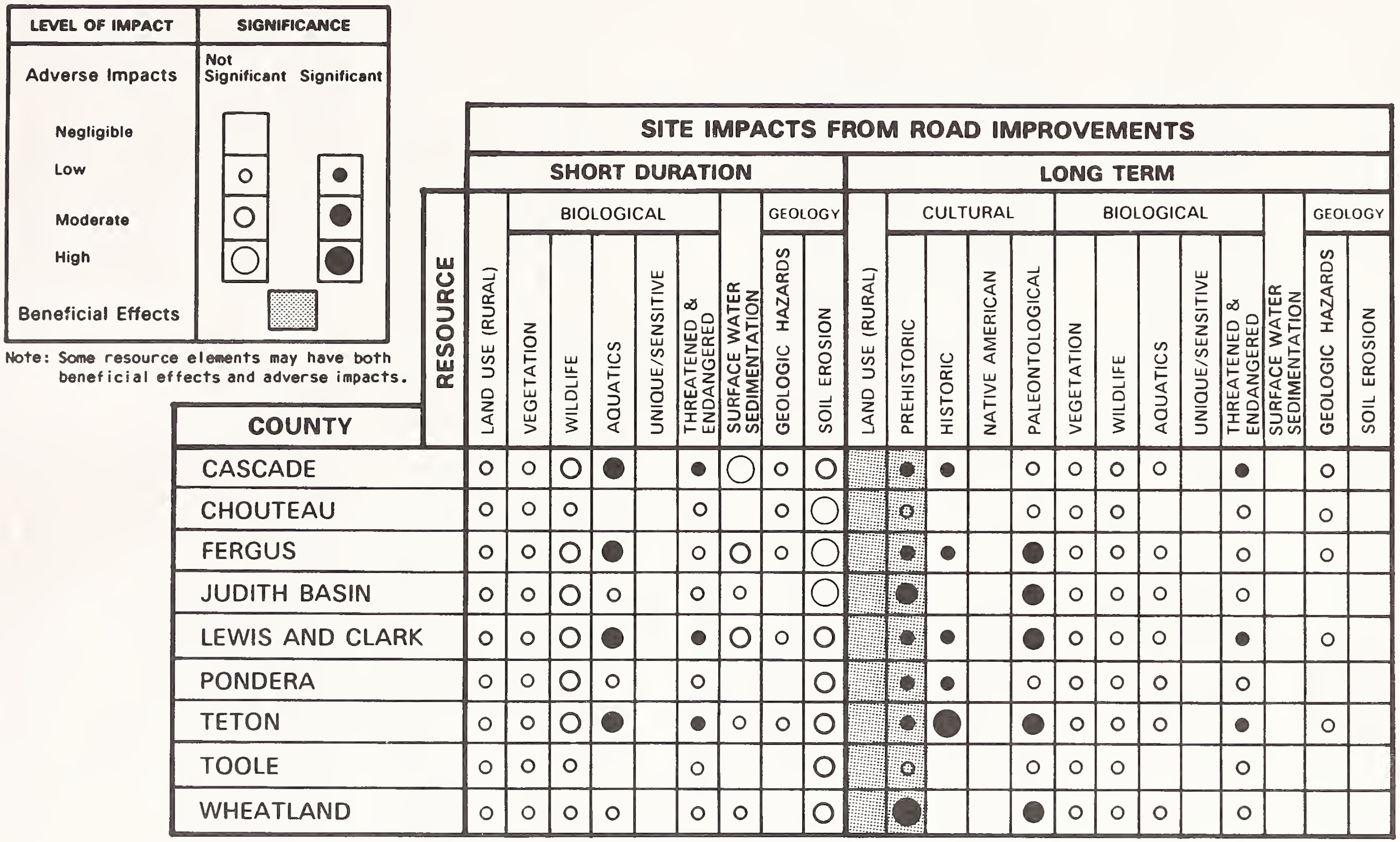
Note: All cultural and paleontological resource impacts are assumed to be long duration.

FIGURE 4.0-1 CONTINUED



Note: All cultural and paleontological resource impacts are assumed to be long duration.

FIGURE 4.0-2 COLLECTIVE SUMMARY OF SITE IMPACTS ASSOCIATED WITH ROAD AND BRIDGE IMPROVEMENTS FOR THE PROPOSED SMALL ICBM PROGRAM IN MONTANA

Alternative. Finally, each resource discussion includes consideration of potential mitigation measures, irreversible and irretrievable resource commitments and the relationship between the local short-term use of man's environment and the maintenance and enhancement of long-term productivity.

4.1 Socioeconomics

Deployment of the proposed Small Intercontinental Ballistic Missile (ICBM) system at Malmstrom Air Force Base (AFB) in Montana is expected to affect the socioeconomic environment of the area. Six major topics are addressed in the socioeconomics analysis: economic base, demographics, housing, education, public services, and public finance.

4.1.1 Impact Analysis Methodology

The impact analysis methodology for socioeconomics involved three separate procedures: evaluation of program impacts, determination of levels of impact (LOI), and determination of the significance of impacts. The methodology also included consideration of a number of assumptions and assumed mitigations. Impacts were evaluated at the local (jurisdictional) and regional level and an overall collective assessment was made for each resource element. Economic base impacts were evaluated at the regional level, which includes the state and the nine county deployment area. Demographics impacts were assessed for counties and cities, as were impacts for public services. Housing effects were evaluated for cities and education impacts were identified for both school districts and individual schools. Public finance impacts were evaluated for counties, cities, and school districts.

4.1.1.1 Evaluation of Program Impacts

Economic Base. The purpose of the economic base analysis was to evaluate the beneficial and adverse effects of the Proposed Action and Alternatives 1, 2, and 3 on the local, regional, and state economies and particular economic sectors. The results of the economic base analysis were used to evaluate other socioeconomic, utilities, transportation, land use, and related effects. Program data used as inputs to the analysis were derived from preliminary deployment plans. The method employed consists of four principal components: (1) estimating direct effects on jobs and spending; (2) projecting secondary changes in employment and sales; (3) forecasting regional labor-force impacts; and (4) evaluating the distribution of effects among local areas within north-central Montana. These four components and the results of each are discussed in the following.

Direct effects on labor and resource requirements were measured using projections prepared by the Army Corps of Engineers (COE). Direct construction employment was derived from labor-hour forecasts, using informed assumptions regarding full-time equivalent (FTE) work-hours per construction worker per year. Payroll earnings were estimated and expenditures were calculated by adjusting earnings and nonlabor outlays for taxes, savings, and nonlocal spending. Direct jobs, earnings, and regional spending were evaluated as important indicators of regional economic benefits. These variables also served as inputs to the multiplier analysis of secondary jobs, income, and government revenues.

Secondary changes in jobs, income, and sales were estimated using an economic (input-output) model for north-central Montana. The model, developed from published data, uses an approach developed by the U.S. Bureau of Economic Analysis. The model is structured to provide information on those sectors most likely to be affected by the

program. Estimates of economic impacts to Montana as a whole were prepared using a similar model at the state level. The measures of secondary jobs, income, and sales predicted by the model were used to evaluate the beneficial impacts of the proposed program. These indicators were also used to assess the likelihood of adverse impacts on local economic activity as a result of high program demands for labor and resources. In addition, secondary jobs, income, and sales were used as inputs to the analyses of labor-force effects and public-sector revenues.

Labor-force impacts were forecast on the basis of projected labor demand by employment type (e.g., Site Activation Task Force [SATAF], construction, assembly and checkout [A&CO], and operations). Local hires, relocating workers, and weekly commuters were estimated using demand and supply factors compiled for the Socioeconomic Monitoring Program for Peacekeeper in Minuteman Silos. The distribution of these labor-force effects to local areas was then estimated based on work and residence locations and commuting distances. Labor-force changes were used to evaluate the effect of the proposed program on unemployment rates, an important measure of regional economic health. In addition, these labor-force impacts were key inputs to the analyses of demographic, housing, education, public finance, and other issues.

Demographics. The purpose of the demographic analysis was to evaluate the size and composition of population changes resulting from Small ICBM deployment and peacetime operations. The key program data input were the forecast of program-related relocating labor force developed in the economic base analysis. The analytical method used was the application of accompaniment rates and average household sizes to the forecast of labor-force changes. This produced an estimate of program-related population change, by job type, for the deployment area region (9 counties) as a whole. This estimate was disaggregated to the local areas within the region in the same pattern as the relocating labor force.

The military-civilian composition of this population change were used to evaluate the potential for adverse demographic impacts. The magnitude of population change was used as a key input to other elements and resources, including public finance, utilities, transportation, and recreation.

Housing. Annual program-induced housing requirements in Great Falls, Lewistown, and Conrad were evaluated and compared to projected locally available vacancies. The impact analysis included four steps: (1) determination of inmigrants' housing preferences by occupational category based on previous large-scale construction programs, (2) estimation of permanent and temporary housing requirements, (3) estimation of new housing starts in response to program demand, and (4) comparison of the program's housing requirements to baseline housing stock and available vacancies. Unaccompanied construction workers were assumed to need one unit each for temporary accommodations or one unit per 1.5 workers for year-round units. All other categories were assigned one per household.

Education. The purpose of this analysis was to evaluate the program-related inmigrant enrollment impacts to the school systems in the Region of Influence (ROI) in terms of staffing, major equipment, and facilities. The data and inputs for this impact evaluation included the historic enrollments, pupil-to-teacher ratios, and facility inventories; the numbers of projected inmigrants as indicated in the economic base analysis; the ratio of school-age children of inmigrant workers to total inmigrants derived from the results of the Socioeconomic Monitoring Program for Peacekeeper in Minuteman Silos; the ratio of

school-age children of inmigrant construction workers to inmigrant construction population; and the enrollment breakdown by elementary, junior high school, and senior high school derived from the results of the Socioeconomic Monitoring Program for Peacekeeper in Minuteman Silos.

Based upon the results from the Socioeconomic Monitoring Program for Peacekeeper in Minuteman Silos, the ratio of school-age children of inmigrant workers to total inmigrants was computed to be 0.16. The ratio of school-age children of inmigrant construction workers to inmigrant construction population was computed to be 0.12. The enrollment level breakdowns for the school-age children were computed to be the following: 55 percent for elementary students in grades K-6; 13 percent for junior high school students in grades 7-8; 29 percent for senior high school students in grades 9-12; and 4 percent for full-time special education students. The ratio of 0.16 was applied to the total inmigrant population estimated for Great Falls in order to determine the number of projected enrollments for the Great Falls Public Schools (GFPS) system. These projected enrollments were distributed among elementary, junior high, senior high, and special education enrollments. The elementary enrollments projected for the GFPS system were distributed among the neighborhood schools according to projected residence location developed in the housing analysis for the different housing options. The ratio of 0.12, that of school-age children to inmigrant construction population, was applied to the total inmigrant population projected for Lewistown and Conrad in order to estimate the number of enrollments for those school districts.

The results used for the impact evaluation included expressing the projected enrollments by level as pupil-to-teacher ratios based upon the 1986-87 staffing for each of the three school systems. The housing options analyses for the City of Great Falls included an additional distribution of the elementary students to neighborhood schools according to projected location of residence. These pupil-to-teacher ratios were compared to the criteria for LOI and significance, and further translated into facility needs.

The results of the impact analysis for education were used to analyze public finance impacts on affected school districts.

Public Services. The purpose of this element was to analyze the effect of the program-induced population increase on the public service delivery system in the ROI. Data used included locally obtained information on current and historical personnel numbers, key indicators of service, and population figures derived in the demographic analysis. For public services, existing service levels and trends for major public safety and health functions were established for each jurisdiction or organization. Demand for these services is expected to increase with the program-induced inmigration. Increases in workloads and personnel requirements were projected by multiplying the baseline per capita rates by program-induced inmigration for each year. For some public services, different demand patterns were taken into account for different segments of the inmigrating population. For police services, military personnel and their dependents, if housed onbase, were assumed to use the services at 80 percent of the rate of the existing population because military police would generally respond to these calls. Weekly commuters, in the area Monday through Friday, were expected to demand services at 70 percent of the rate of the existing population. For some human service agencies that provide services to transient and unemployed people, 10 percent of the inmigrating population was considered to be likely users of the services. For the public and private agencies, workload and personnel requirements were projected by multiplying the baseline per capita rates by the program-induced inmigration for each year. The programed-related personnel, equipment, or facility needs for public services were used as part of the public finance analysis.

Public Finance. Operation and maintenance (O&M) expenditure impacts for municipal government units were estimated based upon the additional personnel needs caused by program-related population inmigration and estimates of the per employee costs for the services where personnel needs were estimated (law enforcement and fire protection services). The O&M expenditures for the remaining services (except debt payments) were estimated on a per capita basis. Expenditures for major capital and equipment outlays as identified by other resource analyses were estimated on a case-by-case basis. School district O&M expenditures were estimated on a per pupil basis. School district expenditures for major capital and equipment outlays also were estimated on a case-by-case basis.

Revenue impacts were estimated for the principal revenue sources of each jurisdiction. Property taxes were calculated by estimating the additional taxable valuation that would be generated by program activities and applying current (fiscal year [FY] 1987) mill-rate levies against the estimated increase in the tax base. Other tax revenues (motor vehicle taxes, licenses, and fees) were estimated on a per capita basis. Other revenue sources (charges for services, fines, fees, redistributed state tax collections, and miscellaneous revenues) were also estimated on a per capita basis.

4.1.1.2 Determination of Levels of Impact

Program impacts, including cumulative effects from other programs, were evaluated as either beneficial or adverse for each socioeconomic element. For those elements where impacts were judged to be adverse, LOIs were assigned using a graded impact classification (negligible, low, moderate, and high).

Impact assessments are provided for short- and long-duration effects. Effects occurring during the construction phase would generally be of a temporary or transitory nature, and relate to buildup of the program workforce, transition from construction to missile A&CO activities, and phase-in to completed system operations staffing levels. Once operations begin, the proposed program population (predominantly military) would require a relatively constant annual level of housing and local government and private sector services. It is the program-induced increases in these service levels that would result in persistent or ongoing, impacts of long duration. The relationships of program requirements to baseline levels in the year 2000 were used as indicators of long-duration impacts, since in this year, they are representative of these continuous service demands.

Economic Base. In general, regional employment and income growth resulting from the program would be treated as a beneficial effect. This interpretation is consistent with accepted economic logic that greater employment and earnings opportunities tend to increase individual well being. However, not all beneficial impacts would occur without cost to regional residents. Some economic sectors may be adversely affected by the proposed program. For example, program-related high-level demands of program requirements for certain construction materials may cause temporary shortages. In addition, phasing down program construction activities may increase local unemployment, adversely affecting local workers.

These effects were estimated using projected changes in employment by major sector and overall regional changes in unemployment. Employment gains by themselves are beneficial, though the magnitude of an employment change frequently is indicative of related increases in prices and reduction in private sector resource availability that could be adverse for local users. Consequently, the percentage change in program-related sectoral employment from the baseline forecast is one of the factors used to measure the

LOI. The other factor is the change in regional unemployment during the phase-down of construction activity. Annual changes exceeding maximum historical fluctuations were defined as high, and normal annual fluctuations were defined as negligible. Low and moderate represent intermediate stages of impact severity. The LOIs for economic base are the following:

- Negligible Impact -- Minimal changes in local labor, materials, or resource markets (no sectoral employment change exceeds 5% of its baseline value); or with-program unemployment rates remaining below baseline rates;

- Low Impact -- Shortages in local labor, materials, or resources remaining below historic levels (employment change in a sector of 5% to 25%); or with-program unemployment rates reach baseline rates;

- Moderate Impact -- Shortages in local labor, materials, or resources reaching historic levels (employment change in a sector of 25% to 50%); or increases in with-program unemployment rates exceed baseline rates;

- High Impact -- Shortages in local labor, materials, or resources exceed historical levels (employment change in a sector of more than 50%); or increased with-program unemployment rates exceed historical rates.

Demographics. Rapid population changes can have adverse impacts on housing, public services, utilities, and other resources. In addition, if program-related population growth, predominantly military, is large compared to the baseline military presence, demographic differences in age, marital status, geographic origin, income, and length of residency between the new inmigrants and current area residents may cause the process of community assimilation to become more difficult. The peak military population (personnel plus dependents) in the Great Falls area was estimated at 13,760 persons in 1972. Military population increases over projected baseline levels up to this prior peak are expected to be negligible, since such increases would be within the range of previous experience. Larger impacts that would be classified as low, moderate, or high are the following:

- Negligible Impact -- Military population with program is less than the 13,760 person prior peak (e.g., Small ICBM-related increases in military population of up to 30% above projected baseline military population in the Great Falls area, of 10,700 persons);

- Low Impact -- Increases in military population above prior peak (i.e., program-related population is more than 30% but less than 50% of the projected baseline military population);

- Moderate Impact -- Increases in military population measurably above prior peak (program-related population is more than 50% but less than 75% of the projected baseline military population);

- High Impact -- Increases in military population substantially above prior peak which makes the assimilation process more difficult (program-related population is more than 75% of the projected baseline military population).

Housing. Housing impacts were evaluated on the basis of increases in demand for housing in the affected communities and by a measure of the local housing market's ability to

meet the increased demand. Evaluation of housing impacts included the housing market's ability to supply the additional housing as program requirements exceeded available vacancies and the potential for overbuilding in the face of short-duration needs that are greater than long-duration needs.

The LOIs for the housing element were determined by the degree of change and disruption that would likely occur in the local housing market as a result of temporary and permanent program-related housing requirements and are defined by the following:

- Negligible Impact -- No observable change in the housing market;
- Low Impact -- Vacancies in a community reduced, but not below, historical levels, some noticeable tightening of the housing market;
- Moderate Impact -- Vacancies in a community reduced to historically low levels; increased difficulty in finding suitable and affordable housing; and potential use of substandard units;
- High Impact -- Vacancies in a community reduced below historic levels; great difficulty in finding suitable and affordable housing; and likely use of substandard units.

Education. Education impacts were based upon the effect of new enrollments on personnel, equipment, and facility needs. Impacts were considered adverse when new enrollments resulted in crowded classroom projections that would have the effect of diminishing the quality of education according to existing local conditions. The additional personnel, equipment, and facilities needs associated with program activities were measured relative to baseline conditions, the effect on classroom sizes (pupil-to-teacher ratios) relative to customary local levels, and a measure of the school system's ability to accommodate the additional enrollments. The ability to accommodate additional enrollments was based upon whether new capital facilities were required, the availability of funding in a timely manner, and sufficient lead time to plan and construct new facilities.

Existing local conditions were used to determine the LOIs. The following table displays the 10-year average pupil-to-teacher ratios for the Great Falls, Lewistown, and Conrad school systems:

	Elementary		Junior High		Senior High	
GFPS	23.3	(K-6)	17.9	(7-8)	19.5	(9-12)
Lewistown	19.2	(K-8)	---	---	16.4	(9-12)
Conrad	16.4	(K-8)	---	---	15.0	(9-12)

Source: GFPS n.d.; Lewistown Public Schools 1987; Conrad Public Schools 1986.

The LOIs for the education element were determined by the extent to which local school systems or individual neighborhood schools would be able to accommodate additional enrollments, and are defined by the following:

- Negligible Impact -- Schools absorb new enrollments with no change in personnel or facilities needs;

- Low Impact -- Small increases in enrollments, representing an increase to the local pupil-to-teacher ratio of fewer than two students;

- Moderate Impact -- Medium increases in enrollments, representing an increase to the local pupil-to-teacher ratio of between two and four students;

- High Impact -- Major increases in enrollments, representing an increase to the local pupil-to-teacher ratio of more than four students.

Public Services. Public services impacts were based upon the effect of new population on personnel, equipment, and facility needs of identified jurisdictions. The ability to accommodate added population was judged based on potential changes in service demands.

The LOIs for public services were based on the ability of governmental service agencies and other organizations to accommodate the added demand for services resulting from increases in population because of the proposed Small ICBM program. Personnel, equipment, and facilities were considered as factors establishing the capacity of existing service delivery systems.

In order to establish a benchmark for community service levels, a measure of activity workload defining service response per employee was calculated for major local government functions. In order to establish prevailing and reasonable service levels, these measures were based on the most recent (1986) information and historical data, where available. For example, the workload measure used for law enforcement (police or sheriff) was the average number of calls for service per sworn officer. These workload benchmarks were used to project the effects of both future baseline and Small ICBM-related population service demands.

The LOI increments for public services (negligible, low, moderate, high) measure the degree to which the proposed Small ICBM program may cause community services to be reduced from projected baseline levels because of changes in service delivery workloads. Discussions with local officials responsible for service delivery, supported by published literature recounting the effects of major programs in rural states in the northern tier, provided a basis of measurement that is reasonable based on professional experience and judgment. Therefore, increases in public service workloads greater than 10 percent were considered to be high since such changes are likely to reduce service response and quality to unacceptable levels for either the provider and/or the recipient. Given this definition of high impacts, and an overall measurement of annual fluctuation in the 3-percent range, intermediate proportional steps have been defined.

The LOIs for public services are the following:

- Negligible Impact -- Annual changes in workload levels of less than 3 percent variance from baseline;

- Low Impact -- Changes in workload between 3 and 6 percent above baseline levels;

- Moderate Impact -- Changes in workload between 7 and 10 percent above baseline levels;

- High Impact -- Changes in workload above 10 percent.

Public Finance. The LOI determination focused on evaluation of program-induced revenue shortfalls of the general fund, special revenue funds, and capital program funds. Revenue shortfalls were chosen as the measure for LOI based upon their potential adverse effects upon the ability of jurisdictions to meet their obligations without collecting additional revenues or reducing services to the community. Such shortfalls would result in reduced service levels that could adversely affect the public's health and safety (e.g., increased response times for the public safety functions). If taxes were raised to maintain customary service levels, an increase in the tax burden on local residents would result.

The categories governmental funds evaluated (general, special revenue, and capital program funds) account for almost 90 percent of all governmental fund expenditures and revenues and represent the accounts that are supported in part by local property taxes. The remaining funds (special assessment, enterprise, trust, and internal service funds) are generally supported by user charges or some similar form of funding; although they would be expected to experience increased outlays, they would not affect the overall tax burden of the respective jurisdiction's residents. Debt and debt service requirements were evaluated on a case-by-case basis.

The LOIs were evaluated for program-induced revenue shortfalls with respect to the size of previous shortfalls of these funds. High impacts were defined when program-induced revenue shortfalls exceeded shortfalls previously experienced by a jurisdiction. The remaining levels were scaled down from this criterion.

The highest revenue shortfall experienced by the City of Great Falls (in constant 1986 dollars) was approximately $1.2 million and occurred in FY 1981. The highest shortfall experienced by Cascade County was approximately $1.7 million and occurred in FY 1983.

Revenue shortfalls have been experienced by the Great Falls Elementary School District in 3 of the past 7 years. The largest shortfall experienced was approximately $1.5 million and occurred in FY 1984. Revenue shortfalls have been experienced by the Great Falls High School District in 2 of the past 7 years. The largest shortfall experienced was approximately $640,000 and occurred in FY 1984.

The LOIs for public finance are the following:

- Negligible Impact -- Program-induced revenues and expenditures are approximately equal.

- Low Impact -- Program-induced revenue shortfalls are less than those previously experienced.

- Moderate Impact -- Program-induced revenue shortfalls approach those previously experienced.

- High Impact -- Program-induced revenue shortfalls persist and are equal to or greater than shortfalls previously experienced by the jurisdiction.

4.1.1.3 Determination of Significance

The significance of socioeconomics impacts were evaluated in accordance with Council on Environmental Quality (CEQ) regulations. Significance was assessed through evaluation of the context and intensity of the impacts. Context includes consideration of the settings (site, local, or regional) and the duration of the impacts. The CEQ regulations provide ten items that should be considered in evaluating intensity. Of these ten items, the following are applicable to the socioeconomics resource:

- The degree to which the proposed action affects public health or safety;

- The degree to which the effects on the quality of the human environment are likely to be highly controversial;

- The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks;

- Whether the action is related to other actions with individually insignificant but cumulatively significant impacts. Significance exists if it is reasonable to anticipate a cumulatively significant impact on the environment. Significance cannot be avoided by terming an action temporary or by breaking it down into small component parts;

- Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

In addition to these considerations, which are specifically identified in the CEQ regulations, the following considerations are judged appropriate for socioeconomic impacts:

- The degree to which area residents would be adversely affected by increased demands and prices, especially for housing;

- The degree to which the proposed program would create excessive fiscal burdens on existing residents; and

- The degree to which the proposed program would reduce public service levels in the affected communities.

The definitions of significance were developed by applying these criteria to each element of the socioeconomics resource.

Economic Base. Growth in jobs and income is generally beneficial. Measurable displacement of private-sector growth (such as construction) is adverse and significant if the private sector is not likely to respond in a timely manner to excesses or shortages which may occur. Unemployment changes are used as one indicator of the potential private sector resource effects. A decrease in unemployment may be indicative of potential shortages while an increase generally means lower resource utilization.

Demographics. Changes in excess of past fluctuations and baseline projections in urban-rural or military-civilian composition are considered significant if the demographic characteristics of inmigrants are markedly different from the characteristics of area residents. Differences in age, marital status, geographic origin, income, and length of residency may increase difficulty in the process of community assimilation.

Housing. Changes in housing demand that cannot be filled by available vacancies or by timely development of affordable and suitable housing are considered significant. A shortage of low and moderate income housing would cause substantial burdens on both civilian and military families.

Education. Impacts are considered significant if increases in existing neighborhood school enrollment would result in pupil-to-teacher ratios that are larger than the state standards which would threaten accreditation. Resolutions to these problems would require major additions of personnel or facilities for which sufficient funds are not expected to be available. For education, the funding criteria refers to the potential availability of funds for the mitigation of identified impacts. For accreditation, the state number of students per classroom was defined to be the following: 26 pupils per classroom for grades 1 and 2; 28 pupils per classroom for grades 3 and 4; 30 pupils per classroom for grades 5 through 12. In calculating the number of pupils per classroom, it was assumed that pupil-to-teacher ratios are the same.

Public Services. Impacts are considered significant if increases in population would reduce service levels of key functions below locally acceptable levels and would require additions of personnel or facilities for which sufficient funds are not expected to be available.

Public Finance. Significance is evaluated by assessing program-induced revenue shortfalls with respect to the financial condition of the jurisdictions as measured by past levels of fund balances. Impacts would be significant if program-induced expenditures exceed revenues for 2 or more years and the sum of the shortfalls would cause fund balances to fall below historic levels.

For the City of Great Falls the lowest fund balance occurred in FY 1980 and measured approximately $4.8 million. Current (FY 1986) balances measure approximately $11.8 million and program-induced revenue shortfalls would have to sum $7 million before impacts would be judged significant. The lowest fund balance in Cascade County occurred in FY 1985 and measured $2.2 million. Current (FY 1986) fund balances measure $2.7 million and program-induced revenue shortfalls would have to sum $500,000 before impacts would be judged significant.

The lowest fund balance of the Great Falls Elementary School District occurred in FY 1985 and measured approximately $4 million. The current (FY 1986) balance measures approximately $4.4 million and program-induced revenue shortfalls would have to total $400,000 before impacts would be judged significant.

The lowest fund balance of the Great Falls High School District occurred in FY 1985 and measured approximately $2.6 million. The current (FY 1986) balance amounted to $3.2 million and program-induced revenue shortfalls would have to total approximately $600,000 before impacts would be judged significant.

4.1.1.4 Assumptions and Assumed Mitigations

Economic Base. All dollars are expressed in 1986 price levels unless specified otherwise. All references to years are in calendar years unless otherwise specified. Comparisons between years were adjusted for inflation. The structure of the local, regional, and state economies was assumed to remain largely unchanged from the present time through the late 1990s. Some variations are expected in the relative growth of major sectors, based on recent trends. In particular, trade and services are expected to continue providing an increasing share of total jobs. Agriculture, mining, and manufacturing output and employment are assumed to be constant, with periodic upturns offsetting declines during the forecast period.

Demographics. The demographic characteristics of military personnel and dependents associated with the proposed program were assumed to be comparable to persons currently working at Malmstrom AFB. Average age including dependents, was assumed to be 21 years. Fewer than 3 percent are expected to have the same place of residence over a 5-year period. The average size of the military household is expected to be 2.45 persons, or 1.45 dependents per military member. Approximately one-half of military wives are expected to seek work.

Housing. It was assumed that the vast majority of workers would live in the largest populated area within a reasonable commuting distance to their worksite, especially the weekly commuters. These areas include the Great Falls urban area, Lewistown, and Conrad.

It was assumed that 12 percent of all accompanied military operations personnel would be able to purchase a house, based on current housing allowances at Malmstrom AFB and the composition of the military operations personnel. It was further assumed that 2.6 percent of the accompanied force and 5 percent of the unaccompanied force would be living in temporary quarters while awaiting permanent units. Rental demand would be composed of 85.4 percent of the accompanied force and 5 percent of the unaccompanied force. The remaining unaccompanied force was assumed to live in new onbase dormitory modules. For construction workers, all SATAF personnel, A&CO personnel, and civilian operations personnel, the data source was the Socioeconomic Monitoring Program for Peacekeeper in Minuteman Silos.

With the construction of 1,746 new military family housing (MFH) units onbase, it was assumed that the market would only respond to a shortage of units created by civilian demand, because the cost of new privately constructed housing units would likely exceed the housing allowance for most military families. A minimal response of 10 percent of the excess demand was used for 1990 since the market cannot respond quickly to short-duration changes. A response rate of 33 percent of excess demand was assumed in all other years. In some cases, existing housing may become available to Air Force families as homeowners in Great Falls sell their current homes to move into larger or newer structures.

Without programmed housing constructed onbase, it was assumed that 10 percent of the military would be able to afford a new privately constructed unit, based on current construction costs of standard units in Great Falls and the current Variable Housing Allowance and Basic Allowance for Quarters levels at Malmstrom AFB. Therefore, it was assumed that the private market would supply 10 percent of excess military demand. The response to civilian demand was assumed to be identical to the onbase MFH construction scenario.

Education. The assumptions for the education element included the following: public education would be made available for all school-age children as required by law, the existing quality of education is the standard for future years, and the number of students per classroom would not be greater than the state maximum numbers. In addition, it was assumed that 16 percent of the inmigrant population in the Great Falls area and 12 percent of the inmigrant population in Lewistown and Conrad are school-age children. These percentages of inmigrant populations were computed from data acquired from the Socioeconomic Monitoring Program for Peacekeeper in Minuteman Silos and reflect the differences in demographic characteristics of the inmigrants in those areas.

Public Services. The assumptions for the public services element included the following: public services presently offered in a jurisdiction would continue to be available and the short-duration inmigrant population would demand these services at the same rate as the existing population. The operations personnel and their dependents would not require some of the public services at the rate of existing population because of the service delivery at Malmstrom AFB. For the Police and Sheriff's departments, the total offenses reported or known of Part I, II, and III crimes, or total radio calls were used as approximations of calls for service.

At the most, 10 percent of the short-duration inmigrant population was considered lower income or unsuccessful job seekers who would use a broad range of services such as temporary shelter, food distribution, and human service referrals. Fourteen percent of the total inmigrant population may need services offered by the Golden Triangle Mental Health Center which include counseling, support groups, and personal improvement programs.

Public Finance. Major assumptions for the public finance analysis were made for identified state, federal, and local government fiscal policy considerations.

The Montana State Legislature's changes to the tax structure of local jurisdictions were assumed to be revenue neutral and state educational-aid programs were maintained at current per pupil rates. New residential and commercial development within local jurisdictions was not considered to be subject to the current property tax freeze. Current mill levies were applied through the FY 1990 to 2000 period. Federal educational aid programs (P.L. 81-874) were considered to remain at current per pupil rates.

4.1.2 Impacts of the Proposed Action

Impacts of the Proposed Action were evaluated for each of the six socioeconomic elements. Optional plans for MFH included programmed housing (1,746 new MFH units onbase), Housing Option H1 (873 new MFH units onbase) and Housing Option H2 (no additional MFH onbase). Short-duration, adverse but not significant impacts for socioeconomics are identified for the economic base and public services elements under all housing options. The Proposed Action with Housing Option H1 would also cause short-duration, not significant impacts on public finances. These impacts would result from program construction activity in the ROI, and in both cases would be moderate and not significant. Long-duration impacts of the Proposed Action with programmed housing would be moderate and not significant for economic base and housing, moderate and significant for demographics and public finance, and high and significant for education and public services. Under Housing Options H1 and H2, long-duration impacts would remain the same for all elements except the housing element which would be high and significant because of increased demand for offbase housing in the Great Falls area. A

summary of program impacts of the Proposed Action and alternatives for the socioeconomic elements and subelements is presented in Figure 4.1.2-1.

4.1.2.1 Economic Base

Considering economic effects to Cascade County, Fergus County, and Pondera County together, impacts on the region's economic base are judged to be primarily beneficial, though short-duration construction labor and resource effects would be moderate because of increases in construction employment of up to 30 percent. This impact is not considered significant since market response would likely be adequate. Unemployment impacts of long duration are considered moderate because of an increase in the Cascade County unemployment rate from 6 to 6.2 percent. This increase is not significant since the private sector would be able to respond in a timely manner.

Program-related employment would begin in 1990 with 1,100 direct and 1,250 secondary jobs created in the nine-county deployment region (Table 4.1.2-1). Regional employment resulting from the program would then increase to 3,430 direct and 1,350 secondary jobs in 1996. Long-duration job creation resulting from the Small ICBM program is projected at 4,350 (3,100 direct and 1,250 secondary) jobs starting in 1999. Local hires for both direct and secondary jobs are expected to peak at 2,300 workers in 1992, declining to 1,260 by 1998.

Regional unemployment rates from 1990 through 1992 are projected to decline about one percentage point because of this increase in job opportunities. Assuming unemployment gradually declines from its recent (1986) levels of 7.2 percent to about 6 percent in 1990, unemployment with the program would average 5 percent during these years. Long-duration unemployment would rise to slightly above its baseline level as construction and A&CO activities are completed and long-duration jobs are filled by military personnel.

In 1993, about $97 million in annual personal income would be created in the nine-county deployment area due to the Small ICBM program. This total is expected to fall to $84 million by 1998. Throughout the life of the program, Department of Defense (DOD) agencies and contractors are expected to purchase a range of goods and services from local businesses, while program personnel would buy many consumer items locally. The Proposed Action is expected to create $990 million in new spending for goods and services in the deployment area from 1990 through the year 2005. Site activation, construction, and A&CO activities would generate new regional demands between 1988 and 1998 totaling $190 million. The A&CO would produce approximately $800 million in regional purchases between 1991 and 2005. Long-duration program-related spending by Air Force personnel and the Malmstrom AFB Contracting Office is expected to total about $60 million per year.

In addition, employment and income would be generated by the proposed program outside the deployment area in other parts of Montana for two reasons. First, contracts for construction and supplies may be awarded outside the nine counties but within the state (such as to firms in Billings or Missoula), creating jobs and income in these areas. Second, economic growth in the nine counties can create opportunities for suppliers and wholesalers elsewhere in the state. Total employment statewide is projected to be 4,710 jobs higher in 1993 and 4,520 jobs higher in the year 2000 because of the program. Statewide income impacts are projected at about $110 million in 1993 and $90 million in the year 2000 because of the Proposed Action. State income tax revenues would be about $2.3 million higher in 1993 and $1.8 million higher in the year 2000 because of the Proposed Action.

LEVEL OF IMPACT	SIGNIFICANCE: Not Significant	SIGNIFICANCE: Significant
Adverse Impacts		
Negligible	▢	
Low	◦	•
Moderate	○	●
High	◯	⬤
Beneficial Effects	(shaded)	

Note: Some resource elements may have both beneficial effects and adverse impacts.

SOCIOECONOMICS

ELEMENT/AFFECTED INTEREST	PROGRAM IMPACTS: SHORT DURATION: PROPOSED ACTION: PROGRAMMED HOUSING	SHORT: PROPOSED ACTION: WITH HOUSING OPTION H1	SHORT: PROPOSED ACTION: WITH HOUSING OPTION H2	SHORT: ALTERNATIVE 1	SHORT: ALTERNATIVE 2	SHORT: ALTERNATIVE 3	LONG DURATION: PROPOSED ACTION: PROGRAMMED HOUSING	LONG: PROPOSED ACTION: WITH HOUSING OPTION H1	LONG: PROPOSED ACTION: WITH HOUSING OPTION H2	LONG: ALTERNATIVE 1	LONG: ALTERNATIVE 2	LONG: ALTERNATIVE 3
ECONOMIC BASE	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)
STATE OF MONTANA	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)
CASCADE COUNTY	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)	○ (shaded)
FERGUS COUNTY	◦ (shaded)	◦ (shaded)	◦ (shaded)	◦ (shaded)	◦ (shaded)	◦ (shaded)						
PONDERA COUNTY	◦ (shaded)	◦ (shaded)	◦ (shaded)	◦ (shaded)	◦ (shaded)	◦ (shaded)						
DEMOGRAPHICS							●	●	●	●	⬤	●
CASCADE COUNTY							●	●	●	●	⬤	●
FERGUS COUNTY												
PONDERA COUNTY												
HOUSING	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)	○ (shaded)	⬤	⬤	○ (shaded)	○ (shaded)	○ (shaded)
GREAT FALLS URBAN AREA	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)	○ (shaded)	⬤	⬤	○ (shaded)	○ (shaded)	○ (shaded)
LEWISTOWN	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)						
CONRAD	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)	(shaded)						
EDUCATION							⬤	⬤	⬤	⬤	⬤	⬤
GREAT FALLS PUBLIC SCHOOLS							⬤	⬤	⬤	⬤	⬤	⬤
GREAT FALLS PRIVATE SCHOOLS												

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FIGURE 4.1.2-1 LOCAL AND REGIONAL IMPACTS TO SOCIOECONOMICS ASSOCIATED WITH THE PROPOSED SMALL ICBM PROGRAM IN MONTANA

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible	☐	
Low	◦	•
Moderate	○	●
High	◯	⬤
Beneficial Effects	░	

Note: Some resource elements may have both beneficial effects and adverse impacts.

SOCIOECONOMICS

ELEMENT/AFFECTED INTEREST	PROGRAM IMPACTS											
	SHORT DURATION						LONG DURATION					
	PROPOSED ACTION						PROPOSED ACTION					
	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
LEWISTOWN PUBLIC SCHOOLS												
CONRAD PUBLIC SCHOOLS												
PUBLIC SERVICES (see note below)	○	○	○	○	○	○	●	●	●	•	⬤	●
CITY OF GREAT FALLS							○	○	○	◦	○	○
CASCADE COUNTY (see note below)							●	●	●	•	⬤	●
CASCADE COUNTY PRIVATE SERVICES	○	○	○	○	○	○	◦	◦	◦	◦	◦	◦
CITY OF LEWISTOWN												
FERGUS COUNTY	◦	◦	◦	◦	◦	◦						
CITY OF CONRAD												
PONDERA COUNTY												
PUBLIC FINANCE		○					●	●	░ ●	●	●	●
CITY OF GREAT FALLS		○					○		░	○	○	○
CASCADE COUNTY							●	●	●	●	●	●
GREAT FALLS ELEMENTARY SCHOOL DISTRICT NO. 1							●	●	●	●	●	●
GREAT FALLS HIGH SCHOOL DISTRICT NO. A.							●	●	●	●	●	●
CITY OF LEWISTOWN												

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Note: Except for overcrowding in the Cascade County jail, impacts would not be significant.

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FIGURE 4.1.2-1 CONTINUED

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible	□	
Low	○	●
Moderate	○	●
High	○	●
Beneficial Effects	▒	

Note: Some resource elements may have both beneficial effects and adverse impacts.

SOCIOECONOMICS

PROGRAM IMPACTS

ELEMENT/AFFECTED INTEREST	SHORT DURATION						LONG DURATION					
	PROPOSED ACTION			ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	PROPOSED ACTION			ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2				PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2			
FERGUS COUNTY												
LEWISTOWN ELEMENTARY SCHOOL DISTRICT NO. 1												
LEWISTOWN HIGH SCHOOL DISTRICT NO. 1												
CITY OF CONRAD												
PONDERA COUNTY												
CONRAD ELEMENTARY SCHOOL DISTRICT NO. 10												
CONRAD HIGH SCHOOL DISTRICT NO. 10												

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FIGURE 4.1.2-1 CONTINUED

Table 4.1.2-1

Employment and Population Changes
Resulting From the Proposed Action
(1990-2000)

Year	Direct Jobs	Secondary Jobs	Total Jobs	Local Hires	New Population[1]	Weekly Commuters[1]
1990	1,100	1,250	2,350	2,040	770	70
1991	1,120	900	2,020	1,470	1,310	50
1992	2,310	1,590	3,900	2,300	3,750	70
1993	2,710	1,560	4,270	2,200	4,910	50
1994	2,580	1,130	3,710	1,440	5,440	30
1995	2,870	1,120	3,990	1,290	6,610	20
1996	3,430	1,350	4,780	1,470	8,120	20
1997	3,260	1,300	4,560	1,360	7,850	10
1998	3,110	1,250	4,360	1,260	7,600	0
1999	3,100	1,250	4,350	1,260	7,580	0
2000	3,100	1,250	4,350	1,260	7,580	0

Note: [1]Great Falls area only. Population changes in other communities are small and temporary.

Cascade County. Most of the economic impacts of the proposed program would occur in the Great Falls area of Cascade County (Table 4.1.2-2). Malmstrom AFB would be the site of most Cascade County direct program jobs, though about 280 workers would be needed elsewhere in the vicinity for construction at launch facilities. Direct employment in the county would begin in 1990 with 1,100 jobs, 860 of which would be at Malmstrom AFB. Construction in the county would phase down gradually after 1990 and phase out by 1995. Assembly and checkout of equipment and facilities would occur between 1992 and 1997. The operations workforce level will build from just a few personnel in 1991 to 3,100 in 1996. In the operations phase beginning in 1998, 99 percent of Small ICBM direct jobs will be military, with the remaining 1 percent (30 jobs) slated to be civilian positions.

Most of the projected jobs created in the ROI by the Proposed Action would be in Cascade County. Secondary employment in 1993 in the county would total 1,040 jobs, declining slightly to 970 by the year 2000. Cascade County would experience annual income gains starting in 1990 at $54 million, increasing to a peak of $90 million in 1996, and leveling off at $78 million by 1999.

Construction activity would be sizable in 1990 and 1991 compared to baseline levels. In 1990, construction employment would increase by about 30 percent over projected baseline levels. Some temporary displacement of other construction would probably

Table 4.1.2-2

Employment and Population Effects of the Proposed Action
for Great Falls, Lewistown, and Conrad, Montana
(1990-2000)

	Fiscal Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Employment											
Direct Employment											
Malmstrom AFB	860	780	1,980	2,380	2,420	2,850	3,430	3,260	3,110	3,100	3,100
Great Falls Area	240	280	130	110							
Lewistown Area		30	150	130	110	10					
Conrad Area		30	50	90	50	10					
Subtotal:	1,100	1,120	2,310	2,710	2,580	2,870	3,430	3,260	3,110	3,100	3,100
Secondary Employment	1,250	900	1,590	1,560	1,130	1,120	1,350	1,300	1,250	1,250	1,250
Total Program-Induced Employment	2,350	2,020	3,900	4,270	3,710	3,990	4,780	4,560	4,360	4,350	4,350
Local Hires	2,040	1,470	2,300	2,200	1,440	1,290	1,470	1,360	1,260	1,260	1,260
Population											
Great Falls Area											
Baseline Conditions											
Urban Area	73,230	73,410	73,600	73,780	73,970	74,160	74,340	74,530	74,720	74,910	75,100
City Plus Base	67,500	67,900	68,100	68,300	68,400	68,600	68,800	68,900	69,100	69,300	69,500
Military Population	10,700	10,700	10,700	10,700	10,700	10,700	10,700	10,700	10,700	10,700	10,700
New Population											
Total	770	1,310	3,750	4,910	5,440	6,610	8,120	7,850	7,600	7,580	7,580
Military	20	670	2,750	4,060	4,810	6,010	7,610	7,580	7,520	7,510	7,510
Population With Small ICBM											
Total, City Plus Base	68,270	69,210	71,850	73,210	73,840	75,210	76,920	76,750	76,700	76,880	77,080
Military	10,720	11,370	13,450	14,760	15,510	16,710	18,310	18,280	18,220	18,210	18,210
Military as Percent of City Plus Base	15.7	16.4	18.7	20.2	21.0	22.2	23.8	23.8	23.8	23.7	23.6
Weekly Commuters	70	50	70	50	30	20	20	10	0	0	0
Lewistown Area											
Baseline Population	7,100	7,100	7,100	7,100	7,200	7,200	7,200	7,200	7,200	7,200	7,300
New Population		20	110	100	80	10					
Weekly Commuters			10	10	10						
Conrad Area											
Baseline Population	3,400	3,400	3,500	3,500	3,500	3,500	3,600	3,600	3,600	3,600	3,700
New Population		20	30	60	30	10					
Weekly Commuters				10							

occur as resources are drawn to the proposed program. Using the criteria specified previously in this section, this short-duration impact is judged to be moderate for construction resources. Construction resource impacts in other years would be smaller than in 1990. Because of the good transportation network serving Great Falls and the rest of the state, any shortages which occur would rapidly be corrected by the normal functioning of the market. These impacts consequently are not judged to be significant. All other sectoral effects would be negligible.

Long-duration impacts are considered moderate because of an increase in the Cascade County unemployment rate from 6 to 6.2 percent. This increase is not significant, since it is not large enough that unmanageable burdens on the local economy could be expected. Gains in overall employment and income, as well as reductions in unemployment, would be beneficial.

The manner in which military personnel are housed would influence the pattern of economic impacts in the Great Falls area. Construction of housing onbase would mean a lower level of payments for rent and home ownership in the local economy than reliance on private sector housing. Families living onbase would also tend to spend more onbase, particularly at the base exchange and commissary. Income gains to the local economy would generally be greater with military personnel housed offbase.

Fergus County. Between 30 and 150 construction jobs are projected for the Lewistown area (Fergus County) (Table 4.1.2-2). These jobs would be associated with road upgrading and construction at or near launch facilities in the eastern portion of the deployment area. A limited number of secondary service and trade jobs (perhaps 40-140) would be created by worker and contractor spending during this construction phase. It is assumed for this analysis that construction activity would occur in the area from 1991 to 1995.

This amount of construction is large by recent Fergus County standards. It is, however, similar to work previously done in the area by Air Force contractors (on periodic Minuteman upgrade programs). Most labor, supplies, and materials would likely be staged through Great Falls. Consequently, the potential for short-duration adverse displacement effects is considered to be low because of the minimal sector demands and not significant since market response would be adequate. No long-duration impacts are expected.

Pondera County. Up to 90 construction jobs would be created in the Conrad area (Pondera County) (Table 4.1.2-2). These jobs would result from work at the launch facilities and on T/E routes in the area. Support-sector jobs (perhaps as many as 60) could potentially be created by worker and contractor spending during construction. Current assumptions imply that work would be accomplished in the area between 1991 and 1995.

This level of construction is not large by recent Pondera County standards. Development of a Strategic Training Range facility in 1986 and 1987, antiballistic missile facilities in the early 1970s, and Minuteman system upgrades periodically since 1961 have established local business capabilities to respond to federal construction programs. As with previous efforts, most labor and materials would likely be supplied from Great Falls. Therefore, the potential for short-duration adverse displacement effects on other construction activities is judged to be low because of the minimal sector demands and not significant since market response would be adequate. No long-duration impacts are expected.

4.1.2.2 Demographics

Overall impacts for the demographic element are considered to be of long duration and moderate because of the increase in military population in Cascade County. These impacts would be significant because the demographic characteristics of the military population are considerably different from those of the local civilian population. Many Small ICBM jobs would be filled by local hires, with local hires peaking at 2,300 in 1992. However, not all employment opportunities, would go to regional residents. The Proposed Action would increase the population of the deployment area by nearly 7,600 persons in the operations phase as civilian personnel and military personnel relocate to the area to fill program jobs. Most of these relocating personnel would change their places of residence to communities in the region, and would continuously reside in the area until their work is finished. Others, estimated at about 100 persons, would be long-distance commuters from other parts of the state. Some construction workers, would likely be in the communities nearest Small ICBM worksites Monday through Friday. They probably would return to their permanent places of residence (such as Billings, Bozeman, or Helena) on the weekends. This pattern would likely be necessary because of the temporary duration of employment, which makes a permanent move impractical.

During program operations, nearly all new residents (7,510 of 7,580 total) would be military personnel and their dependents. They would start arriving in 1987 as part of the SATAF and would continue to arrive in increasing numbers through 1996. The number of new military personnel and their dependents would then stay at about the 7,510 level for the functional life of the system. The typical duration of military assignments on the program would be about 3 to 4 years, as is currently the case at Malmstrom AFB; so there will be a fairly continuous turnover of personnel.

Cascade County. Most of the population growth associated with the proposed program would occur in Cascade County, and particularly in the Great Falls urban area. The number of new program-related, full-time residents in Great Falls would start at about 770 in 1990, build to a peak of 8,120 in 1996, and stabilize just below this peak at 7,580 by the year 2000. Additional people associated with construction activities, probably less than 100 in number, are expected to be Monday-through-Friday residents of Great Falls at the peak of construction activity. These persons would maintain homes elsewhere in the state, and commute weekly to Great Falls.

This pattern of program-related population growth indicates that there would not be an overall "boom-bust" cycle associated with the proposed program. Population changes in the early years of the program would be temporary, and would contain a sizable civilian component, due to construction and A&CO activities (Figure 4.1.2-2). The increase in operations personnel, almost entirely military, would bring about a relatively steady increase in program-related population even as construction and A&CO activities phase down. There would be no "bust" or down-turn typical of other large construction programs.

During program operations, the population impact of 7,580 persons would be composed almost entirely of military personnel and their dependents (7,510 military and 70 civilians). Very few relocating civilian personnel would be needed during operations, since most jobs can be filled by local residents. The military population in Great Falls (personnel and dependents, but excluding retirees) associated with current missions and the planned KC-135R air refueling mission is expected to total 10,700 by 1990. Adding 7,510 military population by the year 2000 as a result of the proposed program would bring the active-duty military personnel and dependents in Great Falls to about 18,210 persons.

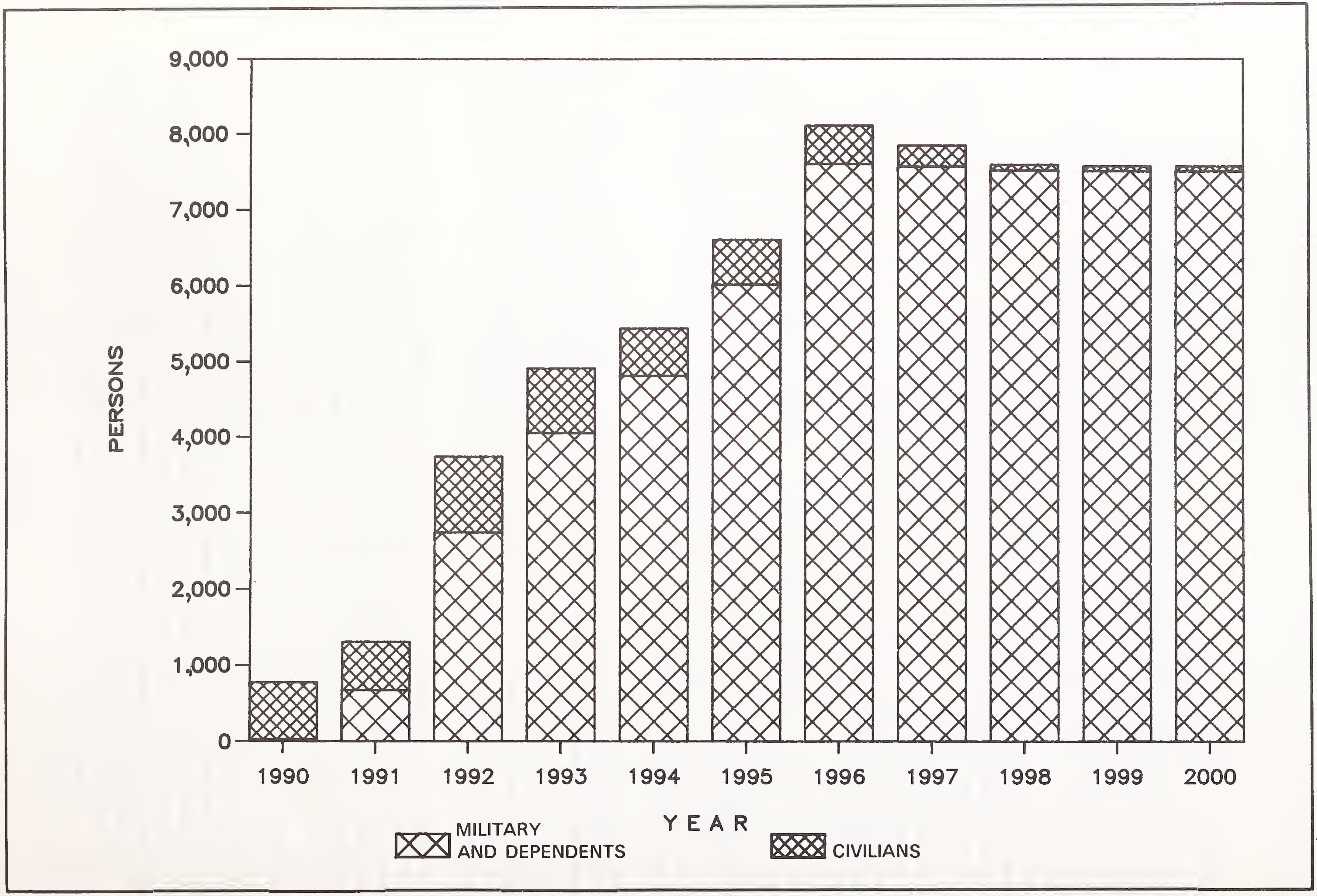

FIGURE 4.1.2-2 MILITARY-CIVILIAN COMPOSITION OF PROGRAM INMIGRATION, 1990-2000

This represents a long-duration, moderate impact, since program-related population is 70 percent of the baseline military population level of 10,700 persons.

The highest share of military population in total community population previously experienced in the Great Falls area was 20.4 percent, recorded in 1972. Comparable though slightly lower shares were registered in 1966 and again in 1976. A military population of 18,210 in the year 2000 would represent 23.6 percent of Great Falls community population in that year, thereby exceeding the previously experienced maximum military population share. Moreover, the new military families would differ in demographic characteristics from other families residing in the Great Falls area, just as current military families differ from the average non-Air Force family. The Air Force population is generally younger and much more mobile and of different geographic origin than the typical Great Falls resident. Applying the criteria previously presented, this constitutes a significant impact. No changes are expected in the urban-rural distribution of the Great Falls area population, since most newcomers would likely choose to reside in the Great Falls urban area. The choice of housing options would not affect the level or significance of demographic impacts.

Fergus County. Lewistown is likely to experience a small temporary population increase while construction is taking place at launch facilities and along roads in the nearby area. Between 20 and 110 new persons would likely be full-time residents of Lewistown and its vicinity during these years. An additional small number of persons (approximately 10) are expected to be residents of the area during the work week, commuting home on weekends.

Compared to the baseline population of Lewistown, numbering about 7,000 persons, these population effects are negligible. No observable changes in the social structure or interaction patterns of the community are expected to occur. Since most new residents are likely to locate in the immediate vicinity of Lewistown where housing and services presently are available, no changes in the urban-rural composition of the area's population are expected.

Pondera County. Conrad, like Lewistown, would probably see a small, short-duration population increase during the construction phase. New full-time residents could number between 30 and 60, depending on commuting patterns and residence choices. A small number of additional Monday-through-Friday residents can also be expected.

Compared to Conrad's baseline population of about 3,500 persons, these population effects are negligible. As with Lewistown, no changes in urban-rural or military-civilian composition of the population are expected to result from the program.

4.1.2.3 Housing

Under the Proposed Action with programmed housing (construction of 1,746 units of military family housing onbase), long-duration impacts would be moderate. However, these impacts would not be significant because the market will be able to provide adequate housing in the ROI. Beneficial effects would occur due to the increased income generated from the occupancy of available vacant temporary and permanent units.

Under Housing Option H1 (construction of 873 units of military family housing onbase), long-duration impacts on housing would be high. Housing and rental prices could rise substantially because of the program-related housing demand. Impacts would be significant because the market would not be able to provide suitable housing for all new

households in the ROI. It is projected that over 200 military households would have to occupy housing units that are considered to be not suitable by the Air Force because of size, cost, and/or distance to the base factors. Beneficial effects would occur because of the increased use of available vacant temporary and permanent units in the community.

Under Housing Option H2 (no new onbase family housing), long-duration impacts on housing would be high. Housing demand would rise substantially because of the program-related housing needs. Impacts would be significant because the housing market would not be able to provide adequate housing to all households in the ROI. It is projected that 900 military households would have to occupy housing units that do not meet onbase standards. Beneficial effects would occur as a result of increased use of available vacant temporary and permanent units in the Great Falls area.

Great Falls Urban Area. Inmigrating program-related military and civilian personnel, both accompanied and unaccompanied, would require housing while working in the Great Falls urban area. Additional housing would be required Monday through Friday by weekly commuters. The required housing is expected to fall into two categories:

- Permanent units for sale or rent, consisting of single/multifamily units, mobile homes, and onbase dormitories; and

- Temporary units, consisting of hotel/motel rooms and other temporary facilities, and recreational vehicle pads/tent spaces.

The military construction program (MCP) for the Proposed Action includes 1,746 units (the programmed number) of family housing to be built on Malmstrom AFB to accommodate approximately 90 percent of married operations personnel. Several other options are available to the Air Force for providing military family housing. Congress has authorized the DOD to enter into long-term contracts under which private firms build housing complexes and lease them to the government for use by military families. This program, called Section 801 housing (Military Construction Authorization Act 1984), permits such housing to be built either on or offbase. Present policy is to acquire only offbase projects, but it can be changed on a case-by-case basis. Construction of such housing would mitigate many of the shortage impacts, such as inflation in rents or burgeoning of trailer parks. Such housing is fully taxable by the community.

The localized impacts of Section 801 housing cannot be analyzed, since siting depends on the offers received in response to requests for proposals. Such projects are legally private ones, without any federal financial involvement. They must comply with local zoning. The community would have ultimate control over placement. In addition, in selecting Section 801 contractors, the Air Force would seek the best facilities for personnel and the least impact on the community, rather than the lowest price.

Offbase Section 801 housing is not specifically part of the Proposed Action or its alternatives, though the build/lease approach might be used to acquire onbase housing. Its availability depends on the number of units Congress authorizes the Air Force to acquire nationwide in the years when they are needed. At present, the Air Force is acquiring most of its new housing in the United States through Section 801, with government-constructed housing largely going overseas.

Two other programs, Section 802 and Section 2267 housing, both provide for construction of private projects for rental primarily to military families. Section 802 allows the government to guarantee a high level of rents in an offbase project in return for the

priority for military families in any units that become vacant. Section 2267 housing is built onbase under a long-term land lease from the government to the builder. The value of the land is reflected in lower rents charged the military personnel occupying the houses. In each case, the projects are privately operated and maintained and are fully taxable. There have been few Section 802 projects due to limitations in the authorizing legislation and the level of rents required to finance and maintain a new project. These rents typically exceed the ability to pay of most Air Force personnel, though this may not prove true in the Great Falls area. Some onbase housing may be built through the Section 2667 program, if experimental projects now being offered for bids at other bases prove successful.

The impacts of onbase Section 801 and Section 2667 housing are the same as government-constructed housing, with one important exception. Either would be subject to property tax, under a specific congressional waiver contained in the Military Leasing Act, 10 U.S.C. 2667. Government constructed housing, on or offbase, is not taxable. Since the decision to build family housing onbase would be greatly influenced by the availability of affordable housing in the Great Falls area and the availability of military construction funds at the time the program need occurs, some variation between the number of units programmed and the number finally approved for construction is quite likely. In order to account for the effects of such variation, two housing options (H1 and H2) have been identified in addition to the programmed housing scenario. Housing Option H1 would provide for the construction of 873 family housing units onbase. This option would provide onbase housing for program personnel in lower enlisted grades whose total housing allowances would likely be insufficient to obtain suitable housing in the support community. Housing Option H2 would provide no construction of onbase family housing and consequently would require all program personnel to use their housing allowances to rent or buy housing in Great Falls.

The programmed number of new onbase housing units that could be built under the Proposed Action is 1,746 units. These units would be completed in time to house the eligible inmigrating military personnel and their dependents as they report to Malmstrom AFB. It is not expected that any private housing response would occur within the urban area since offbase military demand would be minimal. The expected supply of and program-related demand for permanent offbase housing units in the Great Falls urban area are displayed in Figure 4.1.2-3. The acceptable housing stock represents housing units that meet traditional community standards and fulfill normal market demand. The available housing stock represents the total number of units that could be occupied including both standard and substandard units. Initial construction-related housing demand is forecast to increase from 230 units in 1990 to 380 units in 1992, before declining to under 10 units in the final construction year, 1998. Operations housing demand is forecast to rise from about 10 offbase units in 1991 to the long-duration operations demand level of about 280 offbase units beginning in 1996. Vacancy rates would decline because of program-related demand for offbase housing, beginning in 1990. By 1996, available vacancy rates would have fallen to 1.8 percent but would level off at about 2.4 percent during the operations phase.

Most unaccompanied military program-related personnel are required to or prefer to live in dormitory modules onbase (Table 4.1.2-3). Beginning in 1991, approximately 40 dormitory modules would be required to house 90 unaccompanied military personnel. By 1996, the number of dormitory modules necessary to house these 1,180 personnel would reach about 520 and would remain at that level throughout the operations phase of the proposed program. These units would be provided onbase. The demand for dormitory modules onbase would not be affected by Housing Options H1 and H2.

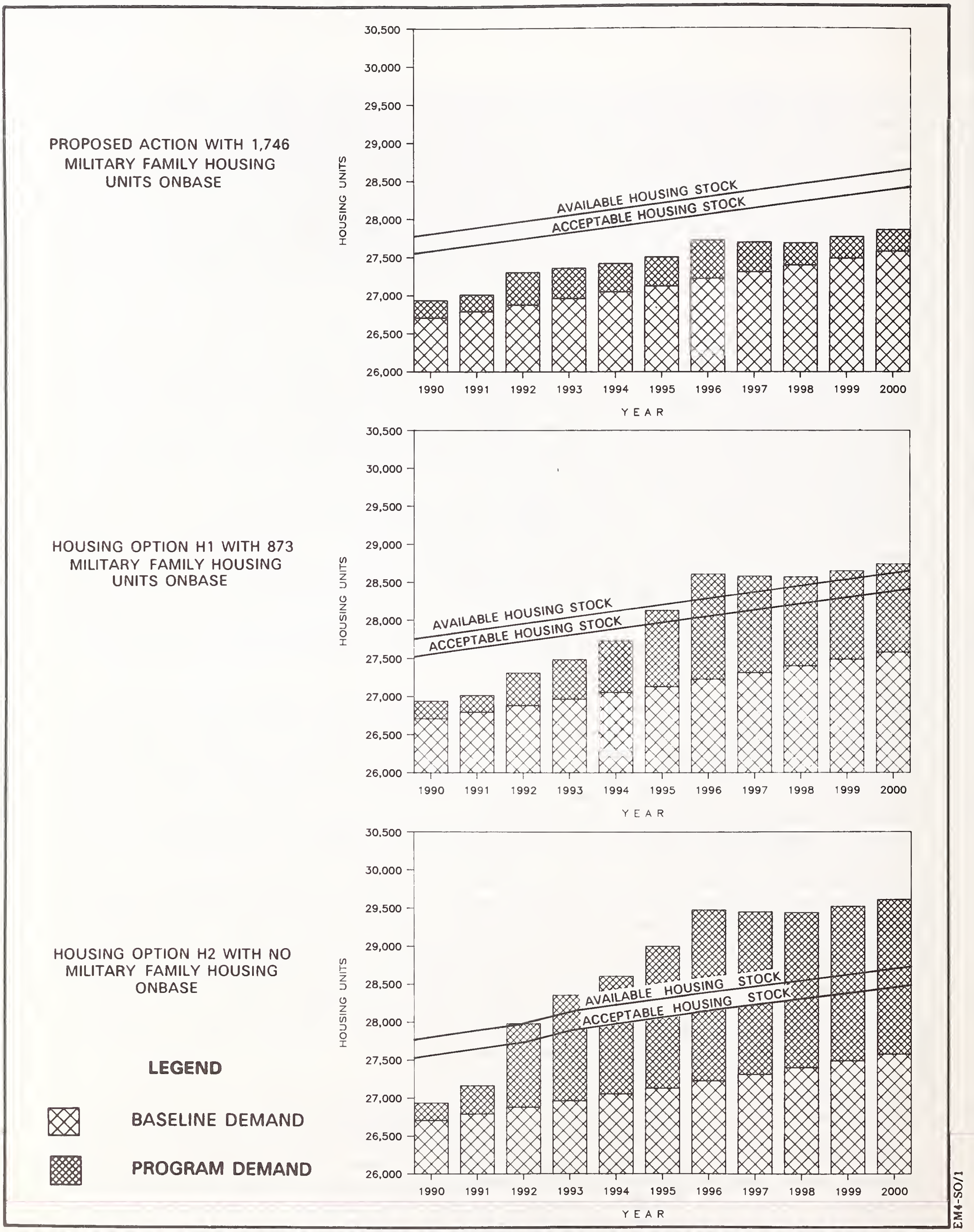

FIGURE 4.1.2-3 PROJECTED CHANGES IN OFFBASE HOUSING DEMAND AND SUPPLY FOR THE GREAT FALLS URBAN AREA, 1990-2000

Table 4.1.2-3

Program-Related Demand for Dormitory Modules, Hotel/Motel Rooms, and Other Temporary Facilities in the Great Falls Urban Area (1990-2000)

	1990	1991	1992	1993	1994	1995
Proposed Action						
Dormitory Modules	0	40	180	280	330	410
Hotel/Motel Rooms	100	70	90	70	30	30
Other Temporary Facilities	40	30	30	30	10	0
Alternative 1						
Dormitory Modules	0	40	160	220	250	300
Hotel/Motel Rooms	100	70	80	60	30	30
Other Temporary Facilities	40	30	30	20	10	0
Alternative 2						
Dormitory Modules	0	40	190	280	330	430
Hotel Motel Rooms	100	80	100	90	30	20
Other Temporary Facilities	40	40	40	30	10	0

	1996	1997	1998	1999	2000
Proposed Action					
Dormitory Modules	520	520	520	520	520
Hotel/Motel Rooms	20	10	0	0	0
Other Temporary Facilities	0	0	0	0	0
Alternative 1					
Dormitory Modules	370	370	370	370	370
Hotel/Motel Rooms	20	10	0	0	0
Other Temporary Facilities	0	0	0	0	0
Alternative 2					
Dormitory Modules	600	630	630	630	630
Hotel Motel Rooms	20	20	20	10	0
Other Temporary Facilities	0	0	0	0	0

Note: Each dormitory module is expected to be occupied by an average of 2.26 unaccompanied military personnel. This average was derived using the expected rank composition of the unaccompanied personnel, and the Air Force Regulations regarding number of personnel occupying modules by rank. The number of long-term unaccompanied personnel under the Proposed Action and Alternative 3 is expected to be 1,180. For Alternative 1, this number is 834, and for Alternative 2, it is 1,430.

The demand for temporary units (Table 4.1.2-3) would come from weekly commuters and workers who are just arriving in the Great Falls area. Temporary housing facilities would be provided to newly arriving military personnel and their dependents onbase. The program-related offbase demand is expected to begin at 100 hotel-motel rooms and 40 other facilities and would decline to zero by the year 1998. Since there are about 400 hotel/motel rooms and 100 other temporary facilities available during the peak season, it is projected that the program-related demands would not have a negative effect upon temporary housing facilities within the Great Falls urban area. The demand and supply of temporary housing units would not be affected by Housing Options H1 and H2.

Under the Proposed Action, with the construction of the programmed housing onbase, long-duration impacts on the permanent housing market are expected to be moderate because vacancy rates would fall to a point where upward pressure on housing prices is likely. These impacts would not be significant because the local housing market would be able to meet the program-related housing demand in every year. Long-duration, beneficial effects are expected for landlords and property owners. Short-duration, beneficial program-related impacts on temporary housing units are expected because of the income generated through the use of otherwise vacant facilities. No long-duration impacts are projected for temporary facilities.

Housing Option H1. Under Housing Option H1, the number of new onbase housing units that would be built is assumed to be 873 units (50% of the programmed housing). These units are scheduled to be ready for occupancy by the inmigrating eligible military personnel and their dependents as they report to Malmstrom AFB. It is not expected that the private market would respond to the program-related housing demand within the urban area under this housing option. The expected supply of and program-related demand for permanent offbase housing units in the Great Falls Urban Area are displayed in Figure 4.1.2-3. Initial construction-related housing demand is forecast to increase from 230 units in 1990 to 380 units in 1992, and fall to under 10 units by 1998. Operations-phase housing demand is forecast to rise from about 10 offbase units in 1991 to the long-duration operations demand level of about 1,160 offbase units beginning in 1996. The program-related housing demand gradually removes available vacant units year-by-year until, in 1995, no suitable housing is available. The deficit would peak in 1996 at about 300 units before leveling off at the continuing operations deficit of 110 units beginning in the year 1998. The current housing allowances for the projected officer and enlisted personnel mix average about $340 monthly per household. New private housing would require about $700 per month for units generally considered suitable. This would be out of the range of affordability for Small ICBM military personnel below grade E-4 (approximately 50% of all operations personnel), who receive an average housing allowance of only $265 per month. Therefore, it is unlikely that the private market would be able to provide new housing units that meet onbase standards at a price that the military households can pay.

Under Housing Option H1, the demand for and the supply of onbase dormitory modules would not differ from the conditions presented under the Proposed Action, programmed housing scenario; neither would the demand for and the supply of temporary housing units differ from the conditions presented in the Proposed Action.

Under Housing Option H1, long-duration impacts on the permanent housing market are expected to be high because vacancy rates fall below the lowest historical rate in the recent past, and an actual shortage of available units is projected. This would cause an increase in the price of housing. These impacts would be significant because the local housing market would not be able to provide a suitable and affordable unit to every Air Force household in the Great Falls urban area. Program-related, short-duration impacts on temporary housing units are expected to be beneficial because of the income

generated through the use of otherwise vacant facilities. No long-duration impacts are projected for temporary facilities.

Housing Option H2. Under Housing Option H2, no new onbase military family housing would be constructed. However, because of the relatively low housing allowance, which the military households are expected to receive, it is unlikely that the private market would be able to satisfy the entire military-related demand for housing offbase through the construction of new units that meet onbase standards. It is projected that about 80 new housing units would be built between 1992 and 1993 in response to the housing requirements of senior personnel with greater housing allowances. The expected supply of and program-related demand for permanent offbase housing units in the Great Falls urban area are displayed in Figure 4.1.2-3. Initial construction-related housing demand is forecast to increase from 230 units in 1990 to 380 units in 1992, and then fall to under 10 units in the final construction year (1998). Operations-phase housing demand is forecast to rise from about 10 offbase units in 1991 to the long-duration operations demand level of about 2,030 offbase units beginning in 1996. The housing needs of inmigrating program-related workers are expected to decrease vacancy rates until 1992 when no suitable housing units would be available. This shortfall would peak in 1996 at about 1,100 units before leveling off at the expected continuing operations-phase shortage of about 900 units. These shortages would have to be met through the use of mobile homes or housing that does not meet onbase standards.

Under Housing Option H2, the demand for and the supply of onbase dormitory modules would not differ from the conditions presented under the Proposed Action.

Under Housing Option H2, the demand for and the supply of temporary housing units would not differ from the conditions presented under the Proposed Action.

Under Housing Option H2, long-duration impacts on the permanent housing market are expected to be high since vacancy rates will fall to zero in 1992, and continue through the operations phase of the program. This would cause upward pressure on housing prices. These impacts would be significant because the local housing market would not be able to build new units which that would be both affordable to the military household and suitable according to Air Force regulations. The short-duration impacts on temporary housing units are expected to be beneficial because of the revenues generated through the use of otherwise vacant facilities. No long-duration impacts are projected for temporary facilities.

City of Lewistown. The construction work on the launch facilities in the Lewistown area is expected to bring a peak of 40 new households to the City of Lewistown in 1992. These households would seek out a mix of permanent and temporary housing units within the city limits. It is estimated that these workers would require 30 permanent units and 10 temporary units in 1992 (the peak year). It is estimated that an additional ten temporary units would be required to house weekly commuters in the same year. The supply of available vacant permanent units in the City of Lewistown is projected to be adequate to meet this demand with no change in the cost of housing experienced by projected baseline residents. During the peak tourist season in 1992, the supply of temporary housing units would not be exhausted. Therefore, the proposed program is expected to have short-duration, beneficial impacts on housing. There are no long-duration, program-related impacts on housing for the City of Lewistown.

City of Conrad. The construction work on the launch facilities near Conrad is expected to reach a peak in 1993. It is expected that about 20 new households would reside in

Conrad in that year. These new households would seek out a mix of permanent and temporary housing units within the city limits. It is estimated that these workers would require 15 permanent units and 5 temporary units in 1993. An additional six temporary units will be required to house weekly commuters in that same year. The supply of rental units and the availability of hotel/motel rooms in Conrad is expected to be sufficient to accommodate this short-duration increase in demand. The program-related demand for housing in the City of Conrad is expected to help the local housing market without displacement of any local citizens or price increases to any current residents; therefore, the short-duration impacts of the proposed program on the housing market in Conrad are expected to be beneficial. There are no long-duration program-related housing impacts in the City of Conrad.

4.1.2.4 Education

The overall program-related impacts on education for all housing options would be of long-duration, high, and significant. This is because the elementary school nearest the base, Loy Elementary, is expected to experience an enrollment increase that will cause pupil-to-teacher ratios to increase above state and local standards. Short-duration impacts on education in the ROI are evaluated to be negligible because the school system can accommodate the increased enrollment.

City of Great Falls. The GFPS system enrollment in 1986-87 was 11,743 regular classroom students plus 450 full-time special education students, or a total enrollment of 12,193 students. Without the program, baseline enrollment is projected to increase to approximately 12,649 in 1990-91; 13,187 in 1996-97; and 13,330 in the academic year 2000-01.

The program-related enrollment is projected to be 123 students in 1990-91, increasing to about 1,300 students in 1996-97, and then declining to 1,210 students in 2000-01 (Figure 4.1.2-4). The breakdown for the peak program-related enrollments is anticipated to be 710 elementary, 166 junior high, 373 senior high, and 50 special education students in the 1996-97 school year. The long-duration, program-related enrollment is expected to be 660 elementary students, 155 junior high students, 347 senior high students, and 48 special education students. Long-duration impacts would occur because the program-related enrollments peak at about 1,300 students in 1996-97 and then stabilize.

The GFPS system has a tradition of minimizing the busing of elementary students by having students attend the neighborhood elementary schools. The attendance boundaries may be changed as the number of elementary school-age children increase or decrease within a neighborhood. Because of the projected elementary enrollment concentration in certain areas of the City of Great Falls according to the different housing options, the long-duration enrollment increase would be most problematic at the elementary level. The junior high and senior high school students are currently bused to the four secondary schools, which provides more flexibility for enrollment management by facility. There should be adequate facilities for the projected secondary enrollments however, pupil-to-teacher ratios would be slightly higher than the current local standards.

The overall increase in elementary school enrollments would affect individual schools in the district differently depending upon where the inmigrant population is assumed to be residing. Using the three options discussed in the housing analysis, the following analyses provide the school-level impacts.

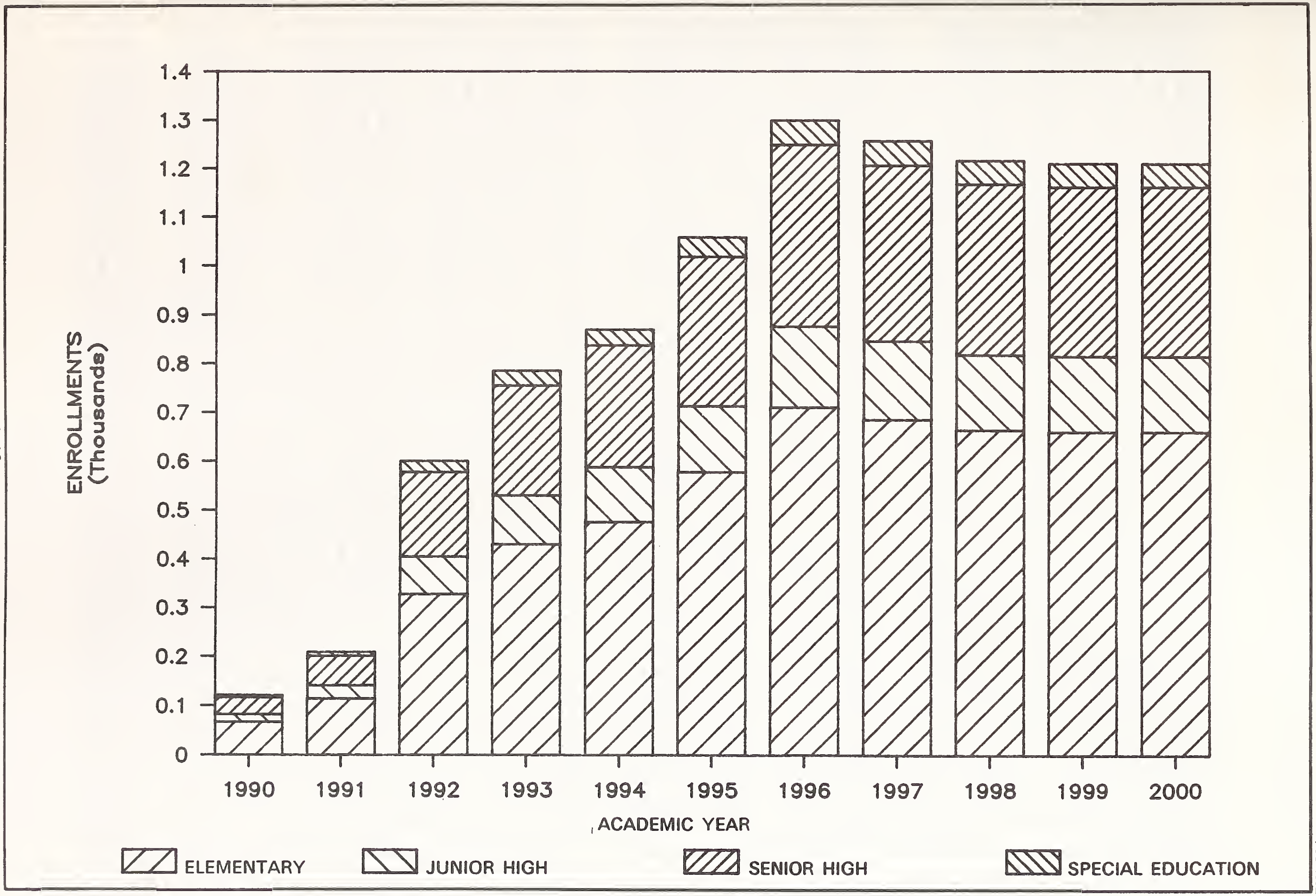

FIGURE 4.1.2-4 GREAT FALLS PUBLIC SCHOOLS PROJECTED PROGRAM RELATED ENROLLMENTS BY GRADE LEVELS, 1990-2000

Out of the projected total of 660 elementary inmigrating students associated with the program during the operations years, 594 are expected to enroll in Loy Elementary School located west of the base. If the neighborhood school concept for elementary pupils were maintained, this projected enrollment would increase the pupil-to-teacher ratio to around 50-to-1. Even if the neighborhood school concept is not followed, the existing excess capacity in the school system would likely be used by future baseline projected enrollment, including children associated with the KC-135R air refueling mission. Therefore, this projected enrollment increase would create a need for another elementary school located near Malmstrom AFB. Because class sizes are higher than existing local levels (23 students per teacher at the elementary level). The program-related enrollment impacts for the Great Falls schools for the programmed housing option are, therefore, evaluated to be high. These impacts are persistent and of long duration and are judged to be significant due to the class sizes exceeding state standards which would require new personnel and facilities without available funding.

Housing Option H1. In the case where 50 percent of the programmed MFH would be onbase, it is projected that Loy, Sunnyside, and Mountain View elementary schools would experience the greatest increases in enrollments. Sunnyside and Mountain View are located southwest of the base. Loy Elementary School is projected to increase by approximately 297 students beginning in 1996 and continuing during program operations. The long-duration enrollment projection for Sunnyside and Mountain View would be approximately 160 elementary students distributed between the two schools. The maximum pupil-to-teacher ratio, that at Loy Elementary School, would be at almost 40-to-1, which represents an increase of around 15 pupils per classroom. This pupil-to-teacher ratio is larger than the local standards, is higher than the state standards, and would require substantial additions to staffing and facilities for which funding may not be available. Therefore, the program-related, long-duration impacts for the Great Falls schools for Housing Option H1 are evaluated to be high and significant.

Housing Option H2. In the case where none of the program-related military population would be housed onbase, the projected elementary school enrollments would be distributed more widely among all the schools of the Great Falls school districts. The two areas projected to have the greatest population increases and elementary enrollments are located west and southwest of the base. The following elementary schools would be affected: Chief Joseph, Lewis and Clark, Morningside, Mountain View, and Sunnyside. During the operations years of the Small ICBM program, the projected additional elementary enrollment for the five schools is 480 students, which would result in serious overcrowding in spite of distribution among the schools. The pupil-to-teacher ratios are expected to rise to around 30-to-1 for each of the five schools, which represents an increase of around 5 pupils per classroom. The projected pupil-to-teacher ratio is larger than the local norm, is higher than the state standards, and would require substantial staffing and some facility modification without unavailable funding. Therefore, the program-related long-duration impacts for the Great Falls schools for this housing option are evaluated to be high and significant.

It is likely that the private schools in Great Falls would experience a slight increase in enrollment from program-related students somewhat reducing public enrollment. However, the existing private schools have excess capacity, and it is not anticipated that the increase would require additional staff, equipment, or facilities.

The College of Great Falls and the Vocational Technical Center may also experience increased enrollments because of the Proposed Action. Any program-related increased enrollments are not expected to result in additional staff, equipment, or facilities.

City of Lewistown. The Lewistown Public School system enrolled 1,631 students in 1986-87, and the enrollments are expected to remain stable for the next several years. Peak-year program-related students are expected to number around 15 in 1992-93. The Lewistown Public School system would be able to accommodate the anticipated program-induced enrollment increase without increasing staffing, equipment, or facilities. Because the program-related enrollments would be absorbed into the Lewistown Public School system with no observable change in the pupil-to-teacher ratios, the short-duration impact for the Lewistown Public School would be negligible.

City of Conrad. The Conrad Public Schools system had 742 students enrolled in the 1986-87 school year. The enrollments at the Conrad School Districts are expected to remain stable with the exception of an increase of approximately 20 to 40 students in 1987-88 resulting from an Air Force Strategic Training Range detachment locating in Conrad. Peak-year program-related enrollment is expected to be about ten students in 1993-94. The Conrad Public School system would be able to accommodate the anticipated program-induced enrollment increase without increasing staffing, equipment, or facilities. Because the program-related enrollments would be absorbed into the Conrad Public Schools with no observable change in the pupil-to-teacher ratios, the short-duration impact for the Conrad Public Schools would be negligible.

4.1.2.5 Public Services

Short-duration public service impacts for all housing options are considered to be moderate because of potential increases in emergency service calls of up to 9 percent in Cascade County, but not significant because of the adequacy of existing staff and facilities to handle such calls. The overall program-related, long-duration impacts to public services, for all housing options, are evaluated to be moderate because of increases in calls for service per officer for the Great Falls Police Department and Cascade County Sheriff Department of up to 9 percent. Although public facilities in the host community generally have the capacity to absorb the program population, public services impacts are considered significant primarily because this population inmigration is expected to exert additional demands on the Cascade County jail. This facility is currently used above its capacity. No funds are currently available for a new or expanded jail. All other jurisdictions would experience increases of less than 3 percent. The existing facilities in the other jurisdictions are adequate to meet the needs of the respective communities and program demands.

For many of the public services, housing locations of the inmigrating military population are of little concerns in that service demand would occur regardless of residence location. However, analyses were conducted for the Great Falls and Cascade County public services by military housing option for the following: general government, police, and fire.

City of Great Falls. Under the Proposed Action with programmed housing, program-induced inmigration would require an increase in staffing in order to maintain existing service levels. Projected increases in city employment would range from a few additional workers in 1990 to approximately 21 personnel in 1996, increasing city government employment in that year from 419 to a total of approximately 440. Six additional officers are projected to be needed in the Police Department, additional personnel would also be needed in departments such as Public Works, Library, and Parks and Recreation. No additional personnel are projected for the city Fire Department. During the operations phase, total program-induced personnel requirements would be 20 workers.

As of March 1987, the Great Falls Police Department had 63 officers and responded to approximately 21,000 calls for service in 1986. Staffing levels, for the most part, are tied to population levels. Program-induced population inmigration could be expected to generate additional calls for service. For these types of programs there is concern within the community that the large influx of population and their demographic characteristics would cause an increase in the crime rate. However, monitoring data from the Socioeconomic Monitoring Program for Peacekeeper in Minuteman Silos have shown that the average age and level of educational attainment among the construction personnel is fairly high due to the technical nature of the program. Military personnel and their dependents who are housed onbase would generate less of a demand on police services since they would be receiving services from the base.

As a measure of service levels for the Police Department, the number of calls for service per sworn officer was used. Under the Proposed Action, projected calls for service are projected to be 23,810 in 1995 and 24,230 in 1996, as compared to baseline projections of 22,155 and 22,185 respectively. This would lead to an 8-percent increase in calls per officer in 1995 and a 10-percent increase in 1996. This could lead to a reduction from current service levels because of increased response time for some calls. In order to maintain existing service levels, an additional five sworn officers in 1995 and an additional six sworn officers in 1996 would be needed above baseline projections. During the operations phase, calls for service are projected to be 24,305 in the year 2000, as compared to a baseline projection of 22,425. This would lead to a 8-percent increase in calls per officer above baseline projections and would call for an additional six officers above baseline projections to maintain existing service levels. To support the additional personnel needed, two new patrol vehicles would be needed above the baseline projections from 1995 and thereafter. The holding facility, which is approaching capacity under baseline growth, would reach its upper limits with the program-induced population inmigration.

As of March 1987, the Great Falls Fire Department had 68 firefighters who responded to 1,107 fire alarms in 1986. The City of Great Falls, with a current population of 58,400, has firefighting facilities that are estimated by local officials to be capable of serving a population of 80,000. Program-induced population inmigration could be expected to generate additional demands for service in the form of increased fire alarms. This could lead to instances of increased response times. Staffing levels, however, are more a function of area than population. When population dispersion reaches a critical point in terms of longer response times, the buildup of required personnel does not coincide with population increases, but rather it is a step function. Depending on where the new population settles, the current staff of three men per pumper (at each of the 4 station houses) would be able to support an increase in the number of alarms without a reduction in service level.

Impacts on the Fire Department would largely depend on the proportion of the military personnel that are housed onbase as well as the areas where others will settle. New housing developments in certain areas (across the river to the north, or anywhere to the west of the base) could call for an additional station as well as firefighters and equipment in order to maintain existing service levels. Under programmed housing, with the majority of military personnel and their dependents housed onbase, demands would be minimal. Malmstrom AFB and the City Fire Department have a mutual-aid agreement. Therefore, both the city and the base could enhance their emergency capabilities when needed. Structural fires account for approximately 50 percent of all alarms received by the Fire Department. Under the Proposed Action (programmed housing), the majority of the new structures associated with the program would be onbase and would not be

handled by the city Fire Department; therefore, demands on the fire service would be minimal. New vehicles would be needed for front-line use in the early 1990s, but this is not the result of any additional program-induced demands but rather the replacement of worn equipment.

Impacts on public services in the City of Great Falls under the Proposed Action with programmed housing are expected to be moderate because of increases in calls per police officer in the 8-percent range during operations years of the program. This is judged to be not significant since existing facilities can accommodate this growth.

Housing Option H1. Under Housing Option H1, approximately 50 percent of the accompanied military personnel would be housed offbase. Program-induced inmigration into the City of Great Falls could be expected to increase staffing levels in order to maintain existing service levels. To maintain existing service levels, city government employment would reach 444 workers in 1996, which is 25 jobs above baseline projections for that year. Seven additional officers would be needed in the Police Department, an additional five personnel would be needed in the Public Works Department, and eight additional personnel would be needed in the Library and Parks and Recreation departments. No additional personnel are projected for the city Fire Department. During the operations phase, potential program-induced personnel requirements would stabilize at 22 jobs above baseline projections.

Housing Option H1 would result in an increase in calls for service to the Great Falls Police Department above those for the programmed housing case since there would be more people living in areas where the city Police Department would respond to calls. Calls are expected to increase to 23,935 in 1995, as compared to baseline projection of approximately 22,155. This would lead to a 9-percent increase in calls for service per officer in 1995. In order to maintain existing service levels, an additional five sworn officers would be needed in 1995. During the program's operations phase, calls for service are projected to be 24,485 in the year 2000, as compared to a baseline projection of approximately 22,425. This would lead to a 9-percent increase in calls for service per officer above baseline projections and would call for an additional six officers to maintain existing service levels. To support these additional officers, two more patrol vehicles would be needed. The increase in population would also put demands on the holding facility, which is already approaching capacity under baseline. These additional demands are not expected to exceed the holding facility's capacity.

Under Housing Option H1, fire alarms could be expected to increase since a larger portion of the influx would be living in areas that would be responded to by the Great Falls Fire Department. As mentioned before, this would not necessarily dictate an increase in firefighting inputs such as personnel or vehicles since fire coverage is tied more to area. It is expected that the majority of program-related housing development would be located in areas to the west and south of the base. These areas would be within safe response time of existing stations; therefore, no need for additional personnel, equipment, or facilities is foreseen.

Under Housing Option H1, long-duration impacts on public services are expected to be moderate because of increases in the number of calls per officer of up to 9 percent from baseline projections. This is judged to be not significant since existing facilities would accommodate this growth.

Housing Option H2. Under Housing Option H2, all accompanied military personnel and their dependents would be housed offbase. Program-induced inmigration into the City of

Great Falls could be expected to increase staffing levels by 30 positions above baseline in 1996 in order to maintain existing service levels. With no additional family housing onbase, military families residing in Great Falls would receive services from city departments as opposed to Malmstrom AFB. Seven additional police officers would be needed, and additional personnel would be needed in other departments such as Public Works, Library, and Parks and Recreation. No additional personnel are projected for the city Fire Department. During the operations phase, program-induced city employment would be 28 positions above baseline projections.

This option would lead to the largest increase in the number of calls for service to the Great Falls Police Department since a vast majority of the population would be living in areas where the city police would respond to calls. Calls for service are projected to reach between 24,000 and 25,000 in 1996, as compared to a baseline projection of between 22,000 and 23,000. In order to maintain existing service levels, an additional seven sworn officers above baseline projections would be needed in 1996. Calls for service are projected to reach 24,665 in the year 2000, as compared to a baseline projection of 22,425. This 9-percent increase in calls for service per officer would require continuation of seven additional sworn officers above baseline projections to maintain existing service levels.

Under Housing Option H2, fire alarms could be expected to increase since a larger portion of the population influx would reside in areas serviced by the Great Falls Fire Department. Since most of the city areas are already well covered by existing stations, no new personnel, equipment, or facility needs are foreseen.

Under Housing Option H2, long-duration impacts are expected to be moderate because of increases in the number of calls for service per officer of up to 9 percent as compared to baseline projections. This is judged to be not significant since existing facilities would accommodate this growth.

Cascade County. In 1986, Cascade County had 587 government employees in 45 departments. Population inmigration would cause the need for additional staffing even if the majority of this influx settles in the City of Great Falls. Under the Proposed Action with all housing options, program-related population growth would call for an additional 20 government employees above baseline projections in 1996, declining to 19 government personnel above baseline projections during program operation years.

Beginning in 1994 and continuing throughout the life of the program, an additional three deputies will be needed by the Sheriff's Department. This staffing projection does not imply ideal service levels, but rather the maintenance of existing ones.

As of January 1987, the Cascade County Sheriff's Department had 34 sworn officers who responded to approximately 3,300 calls for service in 1986. Population inmigration associated with the program could be expected to increase demands on the Sheriff's Department that would lead to the deterioration of existing service levels. Even if the majority of the population influx settled within the city limits of Great Falls, as is expected, demands would still be placed on the department. These demands would be manifested by increased time spent in administering the jail, civil lawsuits, and drug team operations.

Over the last 2 years, staffing in the Sheriff's Department has decreased by five sworn deputies and seven administrative positions. In addition, patrol time has gone down due to increased workload in transporting prisoners as well as time spent in court

proceedings. Therefore, staffing would have to respond in kind to any additional demands in order to maintain the already low service levels. Calls for service are projected to reach 3,777 in 1996 compared to a baseline projection of approximately 3,460 for that year. This is a 9-percent increase in the number of calls for service per officer above baseline levels for that year. In order to maintain existing service levels, an additional three deputies above baseline projections would be needed for that year. In the operations phase, calls are projected to reach 3,790 in the year 2000 as compared to a baseline projection of 3,495 for that year. This would require continuation of the additional three deputies hired during the buildup phase in order to maintain existing service levels. To support these additional deputies, an additional three vehicles would be needed. The county jail currently has an average daily population between 55 and 65 prisoners. If the department adhered to federal regulations, the prisoner population would have a maximum capacity of capped at approximately 45. The program-induced population inmigration could be expected to exert additional pressures on the overcrowding problem.

Program-related, long-duration impacts for the Cascade County Sheriff's Department are considered to be moderate because of increases in calls for service per officer of up to 9 percent. These impacts are considered significant since the population inmigration associated with the program is expected to place additional demands on the Cascade County jail which is already over capacity. No funds are currently available for a new facility.

The Cascade County Fire Council, comprised of 15 fire stations, has between 200 and 300 volunteer firefighters and responds to an average of 180 to 250 fire alarms per year. The majority of the proposed program's inmigrating population would settle in the Great Falls area as opposed to some of the more rural areas which are serviced by the council. Those who do settle in the rural areas could be expected to generate some additional demands, but the magnitude would be small given that brush fires make up the majority of the calls and are not really driven by population increases. Current volunteer staffing levels would be enough to cover any additional demands, though participation rates for volunteers have fallen among the younger population. The various scenarios for military personnel housing would not have a great effect on the council since it is expected that most will live in the Great Falls area anyway.

Thirty full-time employees staffed the City-County Health Department in 1986. Under baseline conditions, it is expected that an additional two staff members would be added to accommodate increases in service demands. No change in facility needs is projected under baseline conditions. For program-related growth, two additional staff members may be needed during the early construction years, increasing to four during the operations phase. It is anticipated that the women/infant/children education (WIC) program would be expanded to handle the increased military population. Other areas of expansion may include the immunization clinics and preschool exam programs.

The Golden Triangle Mental Health Center is staffed by 63 FTE employees for an eight-county area. The Great Falls office is the largest and is expected to be affected most by the program, with 45 of the total personnel. The baseline population growth may require another position for the Great Falls office, but there should be no change in facility requirements. For program-related growth, an additional staff member may be needed to accommodate any increased demand on service, but no additional facility requirements are projected.

The Cascade Office of Human Services was staffed by 72 employees in 1986. Under baseline conditions, it is expected that staffing would increase by an additional position, assuming funding levels are constant. It is not expected that additional baseline facilities would be needed.

During the construction phase, the Proposed Action may attract some unsuccessful job seekers and their families to the Great Falls area. It was estimated that up to 10 percent of the total civilian inmigrants may be in this category. As a result of this component of inmigration, some public assistance programs may experience an increase in demand during the construction phase through 1992. During this year, the increased demand for services may require an additional staff member, but no additional facility needs are projected. In the operations phase, military personnel and their dependents are not expected to have as great a demand for these services as the general population.

Overall long-duration public service impacts for Cascade County would be moderate because of the potential increase in calls for service per officer in the Sheriff's Department of up to 9 percent. These impacts are considered significant because of the existing insufficient jail capacity in Cascade County with no available funds for new facilities. Impacts would be the same for all of the housing options under the Proposed Action. Whether the population settles onbase or offbase, the vast majority would live in an area where service would be provided by either the City of Great Falls or Malmstrom AFB, as opposed to departments under the jurisdiction of Cascade County.

Services Provided by Private Agencies in Cascade County. The medical community in the City of Great Falls includes two major facilities: Columbus Hospital and Montana Deaconess Medical Center, with occupancy rates of around 50 percent. In addition to the regional medical centers, three nursing homes are located in Great Falls with a 100-percent occupancy. Baseline population projections would require additional staff at both Columbus Hospital and the Montana Deaconess Medical Center, but facilities would be adequate. The nursing homes would require additional staffing and facilities.

The Proposed Action with all housing options is expected to increase demand for medical services in the Great Falls area. The projected population increase during the construction phase would require health care services at the same rate as the existing population. The long-duration inmigrants consist of military personnel and their dependents and are not expected to require health care services at the same rate as the existing or baseline populations. The local experience has been that the military and dependents are generally healthier because of age, emphasis on fitness, and physical screening prior to enlistment. However, the obstetrics and gynecology care is used to a greater extent by this group. The facilities should continue to be adequate during program operations. It is not expected that the program would increase the demand for long-duration health care for either elderly or infirm inmigrants.

Columbus and Montana Deaconess plan to accommodate the Malmstrom AFB Health Care Center referrals and should be able to do so under both baseline and Proposed Action conditions. The Malmstrom AFB Hospital is a 20-bed unit that is scheduled to be replaced in 1988 by a newly constructed comprehensive health care center. In addition to the local medical facilities, the Malmstrom Air Force Base Comprehensive Health Care Center may refer patients to regional military facilities such as Fairchild AFB in Spokane, Washington and Fitzsimons Army Medical Center in Denver, Colorado. The specifications of the new center account for the anticipated Malmstrom AFB missions and resulting increased patient loads.

The population inmigration associated with the program could lead to additional demands placed on the emergency services sector. Additional traffic and construction-related activity could cause an increase in calls for service for Bicsak Ambulance and the North Central Mercy Flight. Instances of increased response time or lack of vehicle availability may occur but these situations would be limited. Currently, Bicsak responds to about 10 calls for service per day, down from a 1979 peak of approximately 12 calls per day. The North Central Mercy Flight has been in operation about 5 years and is currently responding to approximately one call for service per day. Increases in calls for service of up to a 30 percent can be provided with the existing personnel and vehicles. Traffic-related accidents make up a large portion of the calls for service. During the construction phase, the largest increases in traffic are expected to occur in 1991 and 1992 and are expected to cause calls for emergency services to increase by 7 percent and 9.5 percent in those 2 years, resulting in a moderate impact. These impacts are considered not significant since the added service can be provided by existing personnel and equipment. During the operations phase, emergency calls are expected to stabilize at 4 percent above baseline projections.

The Great Falls Community Help Line totaled 13,830 calls during 1986. The Help Line is staffed by 1.5 paid full-time personnel and close to 100 volunteers. Under baseline conditions, it is expected that the number of calls would increase to about 15,000 calls per year, and that more volunteers would be required to handle the additional demand for service. The Proposed Action with all housing options is expected to create additional calls for service during both the construction phase and the operations phase. As a result of the increased levels of service, it may become necessary to increase the numbers of volunteer hours and/or paid staff by an additional person.

Opportunities, Inc. was staffed by 20 full-time and 25 part-time employees in 1986. Under baseline conditions, it is expected that some of the service demands, especially the number of families receiving federal commodities and the number of housing referrals, would increase. Because Opportunities, Inc. operates programs that help people make a transition from public assistance to self-sufficiency, it is not expected that the Proposed Action would create a demand on most of the existing service levels except the housing referral program and the federal commodity distribution program. These programs are likely to be used by the unsuccessful job seekers during the construction phase and possibly the lower-ranked military during the operations phase.

The Salvation Army had a full-time staff of 20 employees during 1986. The baseline projections would require an additional employee to handle increase demand for services. No new or expanded facilities are likely to be needed. The program-related population inmigration during the construction phase, particularly some unsuccessful job seekers and their families, may require the services offered through the Salvation Army including temporary shelter, meals, and thrift store use. The shelter was at 40-percent capacity during 1986, and under baseline conditions would be at 50-percent capacity. Therefore, the Salvation Army has the capacity to accommodate transients needing temporary shelter during the construction phase. The Salvation Army served meals to an average of 70 persons per day in 1986, and has the facilities to serve up to 400 persons a day; therefore, they should be able to meet short-duration demand if enough funding is available. During the operations phase, additional demands on the Salvation Army are expected to be minimal since military personnel would be the main component of the population influx and are not expected to use these services extensively. The thrift store would likely increase its inventory under baseline and impact conditions so no shortages in goods available to transients is expected.

Short-duration, program-related impacts for private health and human services are evaluated to be moderate and not significant. Calls for emergency services are projected to rise by 9 percent during the construction phase and it is expected that the unsuccessful job seekers would place a demand on Salvation Army services such that a minor degradation in service levels will occur. Long-duration impacts are evaluated to be low and not significant because of increases in the number of calls for emergencies services of 4 percent.

City of Lewistown. Program-related impacts for public services in the City of Lewistown are evaluated as negligible. The population inmigration associated with the construction phase is expected to increase calls per officer less than 2 percent during these years and would have a minimal effect on fire services.

Fergus County. Short-duration county public services impacts would be low due to projected increases in the number of emergency calls of up to 5 percent. These impacts are considered to be not significant since no additional personnel or facilities would be needed. No long-duration impacts would occur.

City of Conrad. Program-related impacts on public services in the City of Conrad are evaluated as negligible. The population inmigration associated with the construction phase is expected to increase calls per officer less than 2 percent during these years and have a minimal effect on fire services.

Pondera County. Program-related impacts on county public services are evaluated as negligible because of increases in the number of calls per officer and the number of emergency calls of less than 2 percent.

4.1.2.6 Public Finance

Overall long-duration public finance impacts under all the three housing options would be moderate and significant because of adverse effects upon the local school districts and Cascade County. Fiscal impacts to the City of Great Falls would be moderate and not significant under the programmed housing option. Gains in revenue would improve fiscal conditions under Housing Option H1 as additional housing is added to the city's tax base. Under Housing Option H2, the gain in revenue would remove the city's shortfall and have a beneficial effect. Public finance impacts to jurisdictions in the Conrad and Lewistown areas are projected to be negligible.

Program-induced changes in local area employment and population would provide additional revenues to local jurisdictions as well as an increase demand for publicly provided services and, subsequently, additional local government expenditures. Revenue increases associated with program activities include additional property tax collections as housing is developed to support the additional community-based population and employment increases expand the commercial tax base of the jurisdictions. State-shared revenues (principally redistributed excise and state income tax collections) are also expected to increase as the area's economy expands relative to state levels. Other miscellaneous revenues such as fine and fee revenues would also contribute small amounts to program-related total revenue increases. The additional expenditures generated by program-related population inmigration would consist of outlays for additional personnel (additional police officers and sheriff deputies as well as nonuniformed personnel, instructional and counseling personnel in the area schools, as examples), and minor increases in facility maintenance and equipment costs.

The results presented below reflect the program-induced increases in operating expenditures and revenues of the general fund, special revenue funds, and capital program funds of the counties and cities which are analyzed and the general funds of the school districts. These funds typically account for the majority of governmental fund expenditures and revenues. Estimated increases in revenues are presented first and are followed by operating expenditures, net impacts, and a summary of any major capital and equipment needs identified in other resource analyses. Revenues and expenditures of the enterprise funds (water and sewer plant operations), internal service funds, and special assessment funds are not included as these accounts are generally self-supporting and any increases in expenditures from these accounts (except in the case of major capital or equipment needs) would not contribute to the tax burden of the area residents. Major capital or equipment needs supported by these accounts that would be funded by general obligation bond indebtedness, however, are identified in the summary of major capital and equipment needs.

Finally, the results presented were prepared assuming that whatever tax reform measures which were being considered by the Montana State Legislature in the 1987 session would be revenue neutral. Through the regular (1987) session of the Montana State Legislature, a bill to freeze property taxes on all classes of property has passed though no new revenue sources (as an example a sales or other similar tax) were implemented to provide alternative revenues to replace foregone property tax revenues as mandated by Initiative 105. Special session action is anticipated and, as applicable, would be evaluated as more information on actual tax reform provisions becomes available.

City of Great Falls. Program-induced revenues are estimated to increase gradually over the FY 1990 to FY 1996 period, reaching approximately $1.6 million in FY 1996 and stabilizing at approximately $1.5 million in FY 2000 and thereafter (Table 4.1.2-4). Program-induced expenditures follow a similar pattern. Assuming expenditures increase in proportion to the estimated growth in population, program-induced expenditures are estimated to grow to $1.7 million by FY 1996 and stabilize at $1.6 million in FY 2000 and thereafter. Because of the little effect onbase housing development has upon the city's tax base, annual shortfalls ranging up to approximately $100,000 per year are estimated. These shortfalls would represent less than 0.5 percent of the city's projected budget over these years.

No major city-provided capital outlays are expected under this scenario. However, two additional police cars would be required to support the additional officers estimated to be required. Expanded recreational facilities also would be needed (e.g., parks, softball fields, a golf course). No additional fire equipment purchases would be necessary.

Long-duration, fiscal impacts would occur because program-induced revenue shortfalls would persist throughout most of the years during the buildup phase and continue over the life of the program. Impacts would be moderate because the revenue shortfalls are less than those historically experienced by the city but persist over the buildup phase and continue over the life of the program. The impact is judged not significant because the shortfalls represent less than 0.5 percent of the city's projected budget over these years and the cumulative effect of the shortfalls would not reduce fund balances below historical levels.

Housing Option H1. Program-induced revenues are estimated to increase gradually over the FY 1990 to FY 1996 period, reaching approximately $1.7 million in FY 1996 and stabilizing at approximately $1.6 million in FY 2000 and thereafter (Table 4.1.2-4).

Table 4.1.2-4

Fiscal Impacts of the Proposed Action With Programmed Housing, Housing Option H1, and Housing Option H2, City of Great Falls
FY 1990-2000
(thousands 1986$)

	Fiscal Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Baseline											
Revenues/ Expenditures	$19,400.0	$20,300.0	$22,200.0	$22,200.0	$22,300.0	$22,300.0	$22,400.0	$22,400.0	$22,500.0	$22,600.0	$22,600.0
Programmed Housing											
Revenues	$137.0	$292.0	$749.0	$1,019.0	$1,121.0	$1,324.0	$1,612.0	$1,594.0	$1,531.0	$1,512.0	$1,512.0
Expenditures	160.0	248.0	807.0	1,055.0	1,150.0	1,401.0	1,716.0	1,665.0	1,619.0	1,615.0	1,615.0
Net	-23.0	45.0	-57.0	-36.0	-29.0	-78.0	-104.0	-71.0	-88.0	-103.0	-103.0
Housing Option H1											
Revenues	$137.0	$292.0	$749.0	$1,019.0	$1,134.0	$1,355.0	$1,676.0	$1,685.0	$1,622.0	$1,603.0	$1,602.0
Expenditures	160.0	248.0	807.0	1,055.0	1,150.0	1,401.0	1,754.0	1,665.0	1,619.0	1,615.0	1,615.0
Net	-23.0	45.0	-57.0	-36.0	-16.0	-46.0	-78.0	19.0	3.0	-12.0	-14.0
Housing Option H2											
Revenues	$137.0	$292.0	$765.0	$1,088.0	$1,223.0	$1,445.0	$1,765.0	$1,774.0	$1,711.0	$1,692.0	$1,691.0
Expenditures	160.0	248.0	807.0	1,055.0	1,188.0	1,439.0	1,754.0	1,703.0	1,657.0	1,653.0	1,653.0
Net	-23.0	45.0	-42.0	33.0	35.0	6.0	12.0	71.0	54.0	39.0	38.0

Note: Data reflect revenues and expenditures of general fund, special revenue, and capital project funds. Net values may not reflect differences due to rounding.

Revenues under this housing scenario are slightly larger than the Programmed Housing Option during the operations phase (approximately 5%) because of the additional property taxes generated by the offbase housing development under this housing scenario. Program-induced expenditure increases would remain the same as under the previous housing option and slightly smaller revenue shortfalls ranging up to approximately $80,000 over the buildup phase are estimated. These shortfalls would represent less than 0.5 percent of the city's projected budget over these years. During the operations phase the program-induced revenues and expenditures would remain approximately in balance.

No major city-provided capital outlays are expected under this scenario. Law enforcement equipment, recreational facilities, and other equipment needs are similar to those discussed under the programmed housing option.

Because program-induced revenue shortfalls are estimated over the FY 1992 to FY 1996 period but would not be greater than those historically experienced and would not reduce fund balances below historical levels. Short-duration impacts would be moderate and not significant. Because of the offbase housing developed under this scenario, program-induced revenues and expenditures during the operations phase of the program would be in balance and long-duration impacts would be negligible.

Housing Option H2. Program-induced revenues are estimated to increase gradually over the FY 1990 to FY 1997 period, reaching approximately $1.8 million in FY 1997 and stabilizing at approximately $1.7 million in FY 2000 and thereafter (Table 4.1.2-4). Program-induced expenditures follow a similar pattern, reaching $1.8 million in FY 1996 and stabilizing at $1.7 million in FY 2000 and thereafter. Because of the offbase housing developed under this scenario, program-induced revenues would exceed expenditures in 10 of the 12 years over the buildup phase and would continue to exceed expenditures over the life of the program. Facility and equipment needs would remain the same as in the other housing scenarios.

Because program-induced revenues exceed expenditures in most years over the buildup phase and continue over the life of the program, fiscal impacts under this scenario are considered beneficial.

Cascade County. Program-induced revenues in Cascade County are estimated to increase gradually over the FY 1990 to FY 1997 period, reaching approximately $720,000 in FY 1997 and stabilizing at approximately $670,000 in FY 2000 and thereafter (Table 4.1.2-5). Program-induced expenditures follow a similar pattern, growing to approximately $1 million in FY 1996 and stabilizing at $940,000 in FY 2000 and thereafter. Annual revenue shortfalls ranging up to $290,000 are estimated over the FY 1990 to FY 1996 period. These shortfalls would represent approximately 2.5 percent of the county's projected budget over these years. Long-duration revenue shortfalls are expected to be slightly lower and are estimated to be approximately $270,000 in FY 2000 and thereafter.

Program-induced population inmigration would exacerbate conditions at the already crowded jail facility, possibly resulting in additional expenditures needed to house prisoners in alternative facilities. In addition, three patrol vehicles to support the additional officers would be required. No other major capital or equipment needs have been identified.

Long-duration, fiscal impacts are expected because program-induced revenue shortfalls would persist throughout the buildup phase and continue over the life of the program.

Table 4.1.2-5

Fiscal Impacts of the Proposed Action With Programmed Housing, Housing Option H1, and Housing Option H2, Cascade County
FY 1990-2000
(thousands 1986$)

	Fiscal Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Baseline											
Revenues/ Expenditures	$11,600.0	$11,700.0	$11,700.0	$11,700.0	$11,700.0	$11,800.0	$11,800.0	$11,800.0	$11,900.0	$11,900.0	$11,900.0
Programmed Housing											
Revenues	$65.0	$160.0	$330.0	$470.0	$514.0	$587.0	$708.0	$719.0	$685.0	$669.0	$667.0
Expenditures	87.0	184.0	488.0	612.0	707.0	793.0	995.0	966.0	938.0	936.0	936.0
Net	-22.0	-24.0	-157.0	-141.0	-192.0	-206.0	-288.0	-246.0	-253.0	-267.0	-269.0
Housing Option H1											
Revenues	$65.0	$160.0	$330.0	$470.0	$527.0	$618.0	$770.0	$808.0	$774.0	$758.0	$756.0
Expenditures	87.0	184.0	488.0	612.0	707.0	793.0	995.0	966.0	938.0	936.0	936.0
Net	-22.0	-24.0	-157.0	-141.0	-180.0	-175.0	-225.0	-157.0	-164.0	-178.0	-180.0
Housing Option H2											
Revenues	$65.0	$160.0	$345.0	$538.0	$614.0	$706.0	$858.0	$896.0	$862.0	$845.0	$844.0
Expenditures	87.0	184.0	488.0	612.0	707.0	793.0	995.0	966.0	938.0	936.0	936.0
Net	-22.0	-24.0	-142.0	-74.0	-92.0	-87.0	-137.0	-70.0	-76.0	-91.0	-92.0

Note: Data reflect revenues and expenditures of general fund, special revenue, and capital project funds. Net values may not reflect differences due to rounding.

Impacts would be moderate because the revenue shortfalls are less than those historically experienced by the county but would persist over the buildup phase and continue over the life of the program. The impacts for the Proposed Action with Programmed Housing are judged significant because the cumulative effects of the shortfalls would reduce fund balances below historical levels by FY 1995.

Housing Option H1. Program-induced revenues under this housing scenario are estimated to increase gradually over the FY 1990 to FY 1997 period, reaching approximately $810,000 in FY 1997 and stabilizing at approximately $760,000 in FY 2000 and thereafter (Table 4.1.2-5). Revenues under this housing scenario are slightly larger than the programmed housing option because of the additional property taxes generated by the offbase housing development under this housing scenario. Program-induced expenditure increases would remain the same as under the other housing options. Revenue shortfalls ranging up to $230,000 by FY 1996 and remaining at approximately $180,000 in FY 2000 and thereafter are estimated. Capital facility and major equipment needs are similar to those discussed under the Proposed Action.

Long-duration, fiscal impacts are expected because program-revenue shortfalls would persist throughout the buildup phase and continue over the life of the program. Impacts would be moderate because the revenue shortfalls are less than historically experienced by the county but would persist over the buildup phase and would continue over the life of the program. The impacts are judged significant because the cumulative effects of the shortfalls would reduce fund balances below historical levels by FY 1995.

Housing Option H2. Offbase housing development assumed under this scenario would increase revenues available to the county compared to the other scenarios. Program-induced revenue increases are estimated to reach approximately $900,000 by FY 1997 and stabilize at $840,000 in FY 2000 and thereafter (Table 4.1.2-5). Although program-induced expenditures would remain the same as for the other scenarios, the estimated revenues under this housing scenario still are not sufficient to meet program-induced expenditure demands. Revenue shortfalls ranging up to approximately $140,000 in FY 1996 and $90,000 in FY 2000 and thereafter are estimated. Major capital and equipment needs would remain the same as under the other housing scenarios.

Long-duration, fiscal impacts are expected because program-induced revenue shortfalls would persist throughout the buildup phase and continue over the life of the program. These impacts would be moderate because the revenue shortfalls are less than historically experienced by the county but would persist over the buildup phase and would continue over the life of the program. The impacts are judged significant because the cumulative effect of the shortfalls would reduce fund balances below historical levels by FY 1996.

Great Falls Public Schools. Program impacts on school district finances are evaluated separately for the two Great Falls School Districts. Impacts on the elementary school district are discussed first and are followed by the high school district discussion.

Program-induced elementary school district expenditures would be the same under each housing option (Table 4.1.2-6). Assuming expenditures increase in proportion to the estimated growth in student enrollments, program-induced district expenditures are estimated to reach approximately $2.3 million in FY 1997 and stabilize at $2.1 million during the operations phase. If a new elementary school is constructed, additional funds would be required. Under the other housing options, no new construction would be required though expansion or renovation of existing facilities in the vicinity of the base

Table 4.1.2-6

Fiscal Impacts of the Proposed Action With Programmed Housing, Housing Option H1, and Housing Option H2, Great Falls Elementary District No. 1 General Fund, School Years 1990-2000 (thousands 1986$)

	School Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Baseline											
Revenues/ Expenditures	$23,500.0	$23,700.0	$23,800.0	$24,100.0	$24,200.0	$24,200.0	$24,200.0	$24,200.0	$24,200.0	$24,300.0	$24,300.0
Programmed Housing											
Revenues	$72.0	$295.0	$600.0	$1,161.0	$1,408.0	$1,595.0	$1,924.0	$2,175.0	$2,101.0	$2,044.0	$2,040.0
Expenditures	217.0	370.0	1,059.0	1,387.0	1,537.0	1,867.0	2,294.0	2,217.0	2,147.0	2,141.0	2,141.0
Net	-146.0	-75.0	-460.0	-226.0	-128.0	-272.0	-369.0	-42.0	-45.0	-97.0	-101.0
Housing Option H1											
Revenues	$72.0	$295.0	$600.0	$1,142.0	$1,373.0	$1,535.0	$1,857.0	$2,140.0	$2,065.0	$2,009.0	$2,004.0
Expenditures	217.0	370.0	1,059.0	1,387.0	1,537.0	1,867.0	2,294.0	2,217.0	2,147.0	2,141.0	2,141.0
Net	-146.0	-75.0	-460.0	-245.0	-164.0	-332.0	-437.0	-78.0	-81.0	-132.0	-137.0
Housing Option H2											
Revenues	$72.0	$271.0	$510.0	$1,083.0	$1,339.0	$1,501.0	$1,823.0	$2,106.0	$2,032.0	$1,975.0	$1,970.0
Expenditures	217.0	370.0	1,059.0	1,387.0	1,537.0	1,867.0	2,294.0	2,217.0	2,147.0	2,141.0	2,141.0
Net	-146.0	-99.0	-549.0	-304.0	-198.0	-366.0	-471.0	-112.0	-115.0	-167.0	-171.0

Note: Net values may not reflect differences due to rounding.

would be required. Current district indebtedness is relatively low and the reserve bonding capacity of the district of over $30 million would be adequate to meet any costs incurred with new facility construction or expansion.

However, program-induced revenue increases would vary slightly under each housing scenario. School districts receive federal aid under P.L. 81-874 programs for pupils whose parents live and/or work on federal installations. Under the three housing options presented under the Proposed Action, school districts would stand to receive less federal aid under these programs than would be recovered in property taxes as more housing is developed offbase. The annual differences are relatively small, amounting to approximately $70,000 during the operations phase ($2,040,000 in program-induced revenues under the programmed housing scenario versus $1,970,000 under Housing Option H2). Total revenue increases under the three housing options remain relatively equal at approximately $2 million during the operations phase. Because of the lag between when state foundation monies and property taxes are received by the district and when the additional pupils arrive, revenue shortfalls ranging up to $550,000 in FY 1993 (under Housing Option H2) are estimated. Revenue shortfalls of approximately $100,000 to $170,000 are estimated in FY 2000 and thereafter under the three housing options.

Long-duration, fiscal impacts are expected because program-induced revenue shortfalls would persist throughout the buildup phase and continue over the life of the program under all housing options. Impacts would be moderate because the revenue shortfalls are less than historically experienced by the districts but would persist over the buildup phase and would continue over the life of the program. The impacts are judged significant because the cumulative effect of the shortfalls would reduce fund balances below historical levels by FY 1993 under all options.

Program-induced high school district expenditures would also be the same under each housing option. High school district expenditures are estimated to reach approximately $1.4 million in FY 1997 and stabilize at $1.3 million in FY 2000 and thereafter (Table 4.1.2-7). However, no new high school facilities would be required under any of the three housing options.

Similar to the elementary district discussion, program-induced high school district revenues would vary slightly under each housing option, ranging from $1.2 million under Housing Options H1 and H2 to $1.3 million under the Proposed Action in FY 2000 and thereafter. Because of the lag between when state foundation monies and property taxes are received by the district and when the additional pupils arrive, annual revenue shortfalls ranging up to $320,000 in FY 1993 (under Housing Option H2) are estimated.

Long-duration, fiscal impacts are expected because program-induced revenue shortfalls would persist throughout the buildup phase and continue over the life of the program. Impacts would be moderate because the revenue shortfalls are less than those historically experienced by the districts. The impacts are judged significant because the cumulative impact of the shortfalls would reduce fund balances below historical levels by FY 1994 under Housing Option H2 and by FY 1995 under the other housing options.

City of Lewistown. Program effects in Lewistown would be negligible. No increase in city personnel needs have been identified and the city's capital facilities would be adequate to serve the needs associated with the temporary population increase.

Table 4.1.2-7

Fiscal Impacts of the Proposed Action With Programmed Housing, Housing Option H1, and Housing Option H2, Great Falls High School District No. A General Fund, School Years 1990-2000 (thousands 1986$)

	School Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Baseline											
Revenues/ Expenditures	$11,800.0	$12,100.0	$12,300.0	$12,300.0	$12,300.0	$12,600.0	$12,800.0	$13,100.0	$12,200.0	$13,100.0	$13,100.0
Programmed Housing											
Revenues	$47.0	$180.0	$374.0	$713.0	$863.0	$981.0	$1,185.0	$1,322.0	$1,287.0	$1,254.0	$1,251.0
Expenditures	131.0	223.0	639.0	837.0	927.0	1,127.0	1,384.0	1,338.0	1,295.0	1,292.0	1,292.0
Net	-84.0	-43.0	-265.0	-124.0	-64.0	-146.0	-199.0	-16.0	-8.0	-38.0	-41.0
Housing Option H1											
Revenues	$47.0	$180.0	$374.0	$702.0	$842.0	$945.0	$1,144.0	$1,309.0	$1,285.0	$1,231.0	$1,228.0
Expenditures	131.0	223.0	639.0	837.0	927.0	1,127.0	1,384.0	1,338.0	1,295.0	1,292.0	1,292.0
Net	-84.0	-43.0	-265.0	-135.0	-85.0	-181.0	-240.0	-29.0	-11.0	-61.0	-64.0
Housing Option H2											
Revenues	$47.0	$166.0	$322.0	$666.0	$820.0	$923.0	$1,122.0	$1,287.0	$1,242.0	$1,208.0	$1,206.0
Expenditures	131.0	223.0	639.0	837.0	927.0	1,127.0	1,384.0	1,338.0	1,295.0	1,292.0	1,292.0
Net	-84.0	-57.0	-317.0	-171.0	-107.0	-204.0	-262.0	-51.0	-54.0	-84.0	-86.0

Note: Net values may not reflect differences due to rounding.

Fergus County. Program effects in Fergus County would be negligible. No increase in county personnel needs have been identified and the county's capital facilities would be adequate to serve the needs associated with the temporary population increase.

Lewistown Public Schools. Program effects in the Lewistown public schools would be negligible. No additional staff or facilities would be required to serve the temporary increases in student enrollments.

City of Conrad. Program effects in Conrad would be negligible. No increase in city personnel needs have been identified and the city's capital facilities would be adequate to serve the needs associated with the temporary population increase.

Pondera County. Program effects in Pondera County would be negligible. No increase in county personnel needs have been identified and the county's capital facilities would be adequate to serve the needs associated with the temporary population increase.

Conrad Public Schools. Program effects in the Conrad public schools would be negligible. No additional staff or facilities would be required to serve the temporary increases in student enrollments.

4.1.3 Impacts of Alternatives

Three alternatives to the Proposed Action were evaluated. Alternative 1 is defined to be 200 HMLs in pre-engineered buildings at 100 launch facilities, requiring 2,200 direct jobs in the operations phase. Alternative 2 is defined to be 250 HMLs in earth-covered igloos at 125 launch facilities, requiring 3,760 direct jobs in the operations phase. Alternative 3 is defined to be 200 HMLs in pre-engineered buildings at 200 launch facilities, requiring 3,100 direct jobs in the operations phase. Each alternative was analyzed for programmed housing with no housing options considered.

Short-duration impacts associated with Alternatives 1, 2, and 3 are considered to be moderate and not significant for the economic base and for public services elements. All other socioeconomic impacts would be of long duration. Long-duration impacts for both economic base and housing elements would be moderate, not significant for Alternatives 1, 2, and 3. Because Alternative 2 proposes more military personnel than the Proposed Action or the other alternatives, the demographics element is judged to have a high and significant impact for Alternative 2 only, compared to moderate and significant for the others. The education and public services impacts are rated high and significant for Alternatives 1, 2, and 3 because of the lack of capacities at Great Falls neighborhood elementary schools and at the Cascade County jail. The public finance impact is rated moderate and significant overall for Alternatives 1, 2, and 3 because of projected revenue shortfalls for Cascade County and the two Great Falls school districts. The beneficial effects of higher employment and lower vacancy rates would occur throughout the life of the program.

4.1.3.1 Economic Base

Alternative 1. The direct employment requirements of Alternative 1 would increase from 1,100 jobs in 1990 to 2,520 jobs in 1996 before leveling off at 2,200 in 1997 (Table 4.1.3-1). These requirements are about 900 personnel smaller than the Proposed Action by the year 2000 and smaller in the implementation phases as well, since fewer support facilities are needed. Total employment (Figure 4.1.3-1), income, and spending would be comparably reduced. The program-related jobs and income would be beneficial

Table 4.1.3-1

Employment and Population Effects of Alternative 1 for Great Falls, Lewistown, and Conrad, Montana
(1990-2000)

	Calendar Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Employment											
Direct Employment											
Malmstrom AFB	850	760	1,760	1,970	1,960	2,180	2,520	2,200	2,200	2,200	2,200
Great Falls Area	250	310	150	120							
Lewistown Area		30	170	140	120	20					
Conrad Area		30	50	100	50	10					
Subtotal:	1,100	1,130	2,130	2,330	2,130	2,210	2,520	2,200	2,200	2,200	2,200
Secondary Employment	1,170	820	1,420	1,310	930	860	980	930	890	880	880
Total Program Employment	2,270	1,950	3,550	3,640	3,060	3,070	3,500	3,130	3,090	3,080	3,080
Local Hires	1,940	1,390	2,100	1,920	1,240	1,020	1,100	990	890	890	890
Population											
Great Falls Urban Area											
New Population	760	1,310	3,380	4,050	4,350	4,980	5,890	5,630	5,380	5,360	5,360
Weekly Commuters	70	50	60	50	30	20	20	10			
Lewistown Area											
New Population		20	120	100	90	10					
Weekly Commuters			10	10	10						
Conrad Area											
New Population		20	30	60	30	10					
Weekly Commuters				10							

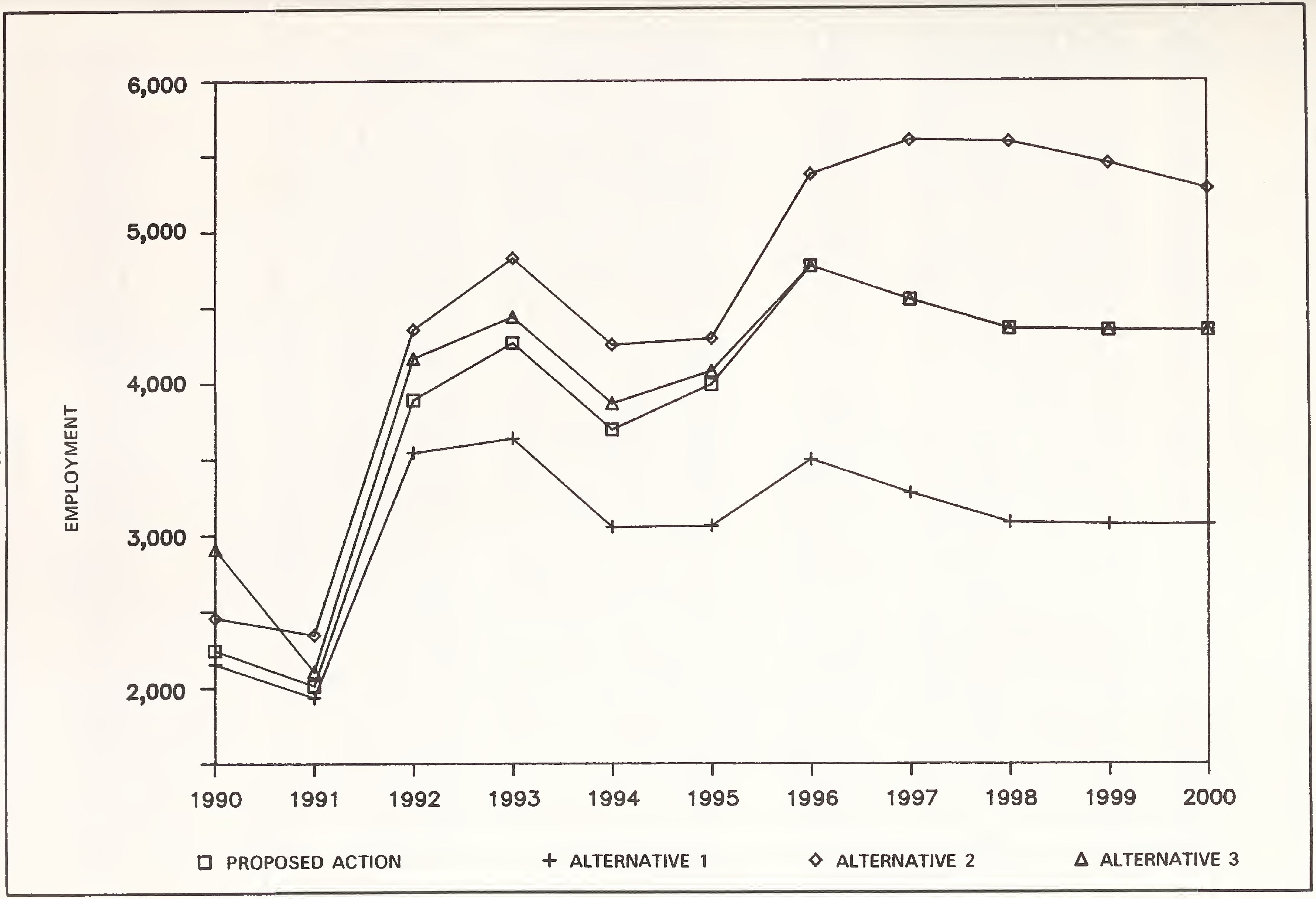

FIGURE 4.1.3-1 1990-2000 TOTAL DIRECT AND SECONDARY EMPLOYMENT FOR THE PROPOSED ACTION AND ALTERNATIVES 1, 2, AND 3

effects of this alternative. Effects on the construction sector under this alternative would be smaller than the Proposed Action, but would remain moderate and not significant.

Alternative 2. The direct employment requirements of Alternative 2 (Table 4.1.3-2) would rise from 1,140 jobs in 1990 to 4,010 in 1997 and 1998 before stabilizing at 3,760 by the year 2000. These job levels are about 660 jobs greater than the Proposed Action by the year 2000. Construction employment is comparably greater than for the Proposed Action since more facilities are needed to support the larger operations workforce (Figure 4.1.3-1). Total employment, income, and spending would consequently be higher than those estimated for the Proposed Action. Therefore, the beneficial economic effects of Alternative 2 would be greater than the Proposed Action. Adverse construction resource effects would be somewhat greater than the Proposed Action, though they would remain moderate and not significant when all areas within the ROI are considered together.

Alternative 3. Manpower and resource requirements for Alternative 3, which are 200 HMLs at 200 launch facilities in pre-engineered buildings, are virtually equal to those for the Proposed Action. Consequently, the impacts for Alternative 3 are the same as those presented under the Proposed Action.

4.1.3.2 Demographics

Alternative 1. Short- and long-duration demographic effects of this alternative would be less than the Proposed Action (Figure 4.1.3-2). Total population change in the Great Falls area would peak at 5,890 in 1996, with a long-duration population gain of 5,360 (of which 5,310 are military) personnel and dependents. The operations-phase military population change is estimated at about 50 percent of the baseline population, and consequently is judged to be a moderate impact. Projected total military population is estimated to be 21.4 percent of Great Falls community population, higher than the previous maximum of 20.4 percent. Since the demographic characteristics of the new population would be substantially different from the average characteristics of area residents, this higher share implies that demographic impacts would be significant.

Alternative 2. Demographic impacts of Alternative 2 would be greater than the Proposed Action (Figure 4.1.3-2). Total population change would peak in 1997 at 9,620 persons, reaching 9,200 by the year 2000 (of which 9,110 are military personnel plus dependents). This long-duration impact is expected to be high, since it is an 85-percent change above baseline military population. The impact also is judged to be significant, since the new population is expected to differ demographically from other area residents and the with-program military share of community population increases to 25.2 percent.

Alternative 3. Population inmigration under Alternative 3 is virtually equal to the results presented for the Proposed Action. Consequently, impacts remain moderate and significant.

4.1.3.3 Housing

Alternative 1.

City of Great Falls. The programmed number of new onbase housing units to be built under Alternative 1 is 1,230 units compared to 1,746 units for the Proposed Action. The expected supply of and program-related demand for permanent offbase housing units in

Table 4.1.3-2

Employment and Population Effects of Alternative 2 for Great Falls, Lewistown, and Conrad, Montana
(1990-2000)

	Calendar Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Employment											
Direct Employment											
Malmstrom AFB	880	810	2,050	2,460	2,410	2,850	3,830	4,010	4,010	3,930	3,760
Great Falls Area	260	320	180	150							
Lewistown Area		30	190	170	210	40					
Conrad Area		30	30	120	90	30					
Subtotal:	1,140	1,190	2,450	2,900	2,710	2,920	3,830	4,010	4,010	3,930	3,760
Secondary Employment	1,430	1,160	1,900	1,930	1,540	1,370	1,550	1,590	1,590	1,560	1,520
Total Program Employment	2,570	2,350	4,350	4,830	4,250	4,290	5,380	5,600	5,600	5,490	5,280
Local Hires	2,240	1,780	2,720	2,700	1,940	1,540	1,640	1,690	1,680	1,610	1,530
Population											
Great Falls Urban Area											
New Population	790	1,360	3,830	5,010	5,460	6,730	9,170	9,620	9,610	9,430	9,200
Weekly Commuters	70	60	70	60	20	20	10	10	10	10	
Lewistown Area											
New Population		20	140	130	160	30					
Weekly Commuters			10	10	20						
Conrad Area											
New Population		20	20	70	60	20					
Weekly Commuters				10	10						

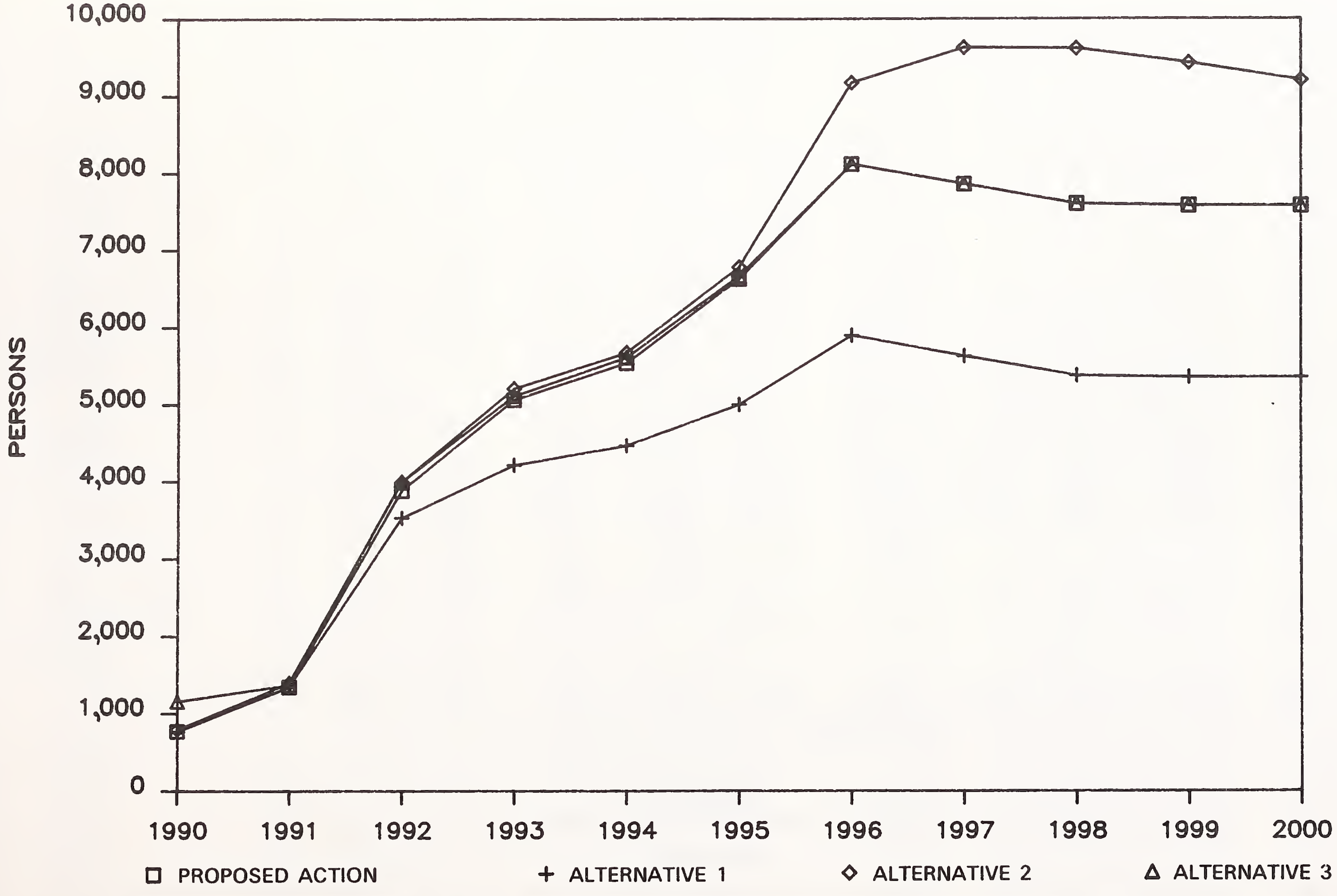

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FIGURE 4.1.3-2 1990-2000 SMALL ICBM POPULATION INMIGRATION FOR THE PROPOSED ACTION AND ALTERNATIVES 1, 2, AND 3

the Great Falls urban area for the years 1990 through 2000 is displayed in Figure 4.1.3-3. Construction-related housing demand is forecast to increase from 230 units in 1990 to a peak at 370 units in the year 1992, and then fall to under 10 units in the final construction year (1998). Operations-related housing demand is forecast to rise from about 10 offbase units in 1991, to the long-duration level of about 210 offbase units beginning in 1996. The program-related demand for housing would drop available vacancy rates below 2.6 percent, beginning in 1992 and would continue through the operations phase.

The demand for onbase dormitory modules under Alternative 1 is expected to begin at 40 units in 1991, and rise to 370 units by 1996, continuing at this level during the operations phase.

Program-related offbase demand for temporary units is expected to begin in 1989 at about ten hotel/motel rooms. This demand is expected to peak in 1990 at about 100 hotel/motel rooms and 40 other temporary facilities, before falling to about 10 hotel/motel rooms in 1997 and declining from 1997 and thereafter. Since there are about 400 hotel/motel rooms and 100 other temporary facilities available during the peak season, the program-related demands would have a beneficial effect on temporary housing facilities within the Great Falls urban area.

Under Alternative 1, long-duration impacts on the permanent housing market are expected to be moderate because vacancy rates would fall to the historical minimum. These impacts are not likely to be significant because the local housing market would be able to meet the housing demand in every year. Long-duration impacts are expected to be beneficial to landlords and property owners since the number of vacant units will be reduced. Short-duration program-related impacts on temporary housing units are expected to be beneficial because of the income generated through the use of otherwise vacant facilities.

City of Lewistown. The construction work on the launch facilities in the Lewistown area is expected to bring a peak of about 50 new households to the City of Lewistown in 1992. These households would seek out a mix of permanent and temporary housing units within the city limits. It is estimated that these workers would require 35 permanent units and 15 temporary units in 1992 (the peak year). An additional ten temporary units may be required to house weekly commuters in the same year. The supply of available vacant permanent units in the City of Lewistown is projected to be adequate to meet this demand with no change in the cost of housing experienced by projected baseline residents. During the peak tourist season in 1992, the supply of temporary housing units would not be exhausted.

The program-related demand for housing in the City of Lewistown is expected to help the local housing market without any displacement of local citizens or price increases to current residents. Therefore, similar to the Proposed Action, Alternative 1 is expected to have a beneficial short-duration impact on housing. There are no long-duration program-related impacts on housing for the City of Lewistown.

City of Conrad. The construction work on the launch facilities near Conrad is expected to reach a peak in 1993. It is expected that about 25 new households would reside in Conrad in that year. It is estimated that these workers would require 15 permanent units and 10 temporary units in 1993. An additional ten temporary units may be required to house weekly commuters in the same year. The supply of rental units and the availability of hotel/motel rooms in Conrad is expected to be sufficient to accommodate this short-duration increase in demand.

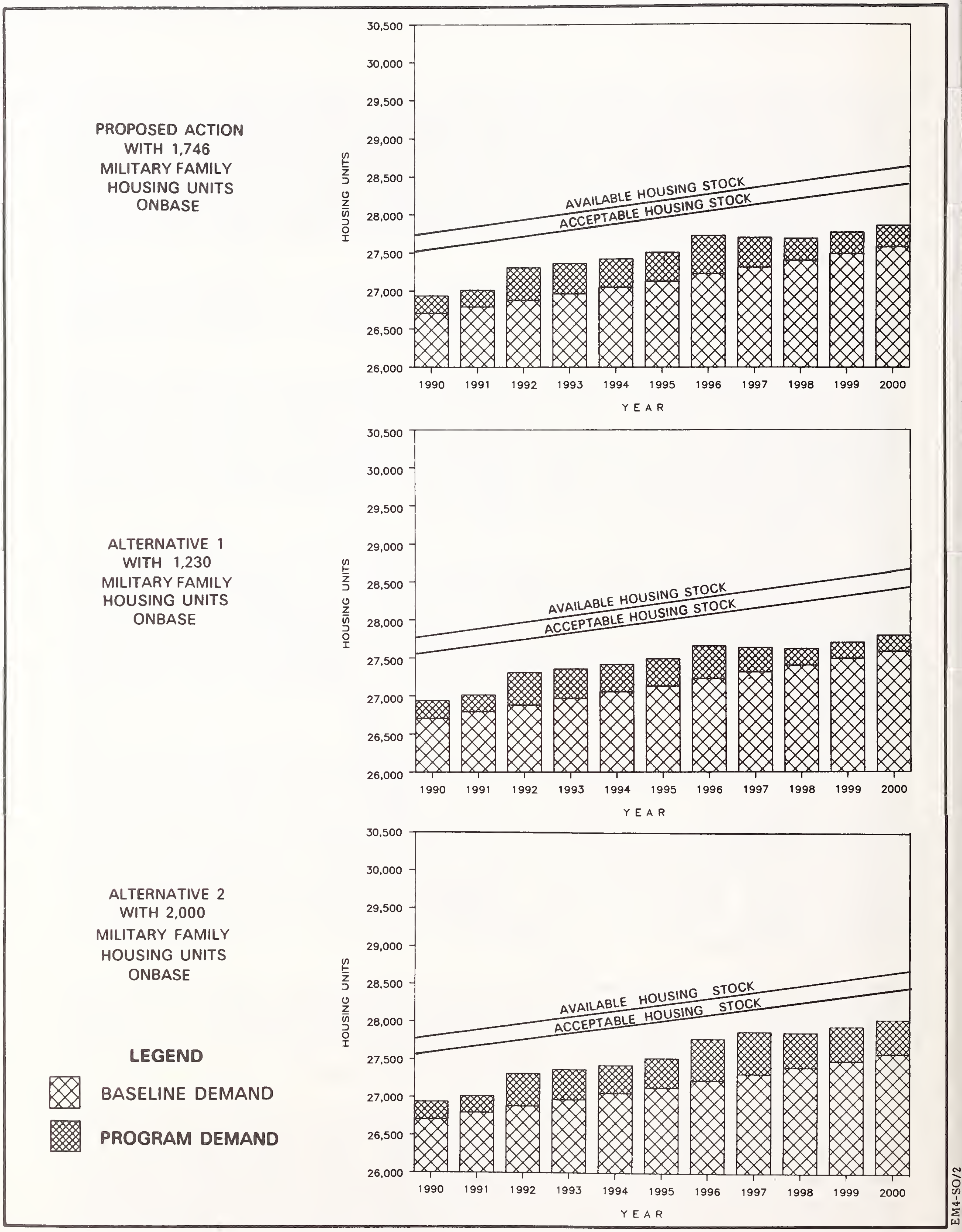

FIGURE 4.1.3-3 PROJECTED CHANGES IN OFFBASE HOUSING DEMAND AND SUPPLY FOR THE GREAT FALLS URBAN AREA, 1990-2000

The program-related demand for housing in the City of Conrad is expected to help the local housing market without displacement of any local citizens or price increases to any current residents; therefore, similar to the Proposed Action, the short-duration impacts of Alternative 1 on the housing market in Conrad are expected to be beneficial. There are no long-duration program-related housing impacts for the City of Conrad.

Alternative 2.

City of Great Falls. The programmed number of new onbase housing units that would be built under Alternative 2 is 2,000 units. Initial construction-related housing demand is forecast to increase from 230 units in 1990 to a peak of 410 units in 1992, and fall to under 10 units in the final construction year (1998). Operations-related housing demand is forecast to rise from about 10 offbase units in 1991 to the long-duration level of about 460 offbase units beginning in 1996. During the construction phase, it is estimated that vacancy rates would fall below 2.1 percent beginning in 1992 and would continue throughout the operations phase of the program. In 1996, the available vacancy rate would drop to its lowest point, 1.6 percent.

The demand for onbase dormitory modules under Alternative 2 is expected to begin at 40 units in 1991 and rise to an operations-related demand of 630 units by the year 1997.

Program-related offbase demand for temporary units is expected to begin in 1990 at about 100 hotel/motel rooms and 40 other temporary facilities, before falling to about 10 hotel/motel rooms in 1999 and vanishing from 1999 and thereafter. Since there are about 400 hotel/motel rooms and 100 other temporary facilities available during the peak season, it is projected that the program-related demands would have a beneficial effect on temporary housing facilities within the Great Falls urban area.

Under Alternative 2 with programmed housing onbase, long-duration impacts on the permanent housing market are expected to be moderate because vacancy rates would fall to the historical minimum. These impacts are not likely to be significant because the local housing market would be able to meet the housing demand in every year. Both the short- and long-duration impacts are expected to be beneficial to landlords and property owners. Short-duration program-related impacts on temporary housing units are expected and would be beneficial because of the revenues generated through the use of otherwise vacant facilities.

If no military family housing were built onbase, operations-phase housing demand would increase from about 160 offbase units in 1991 to a long-term operations demand of about 2,450 offbase units beginning in 1996. It is projected that about 315 new housing units would be built between 1992 and 1993 in response to the housing requirements of senior level personnel. Inmigrating workers and their families are expected to utilize all vacant suitable housing units by 1992. The shortage of suitable housing would peak in 1996 at about 1,170 units compared to 1,100 units for the Proposed Action with Housing Option H2. The operations-phase housing shortfall of about 1,090 units would be 190 units greater than the 900-unit shortfall for the Proposed Action with Housing Option H2, an increase of 21 percent. As a result, housing impacts for Alternative 2 with Housing Option H2 would be high and significant as currently reported for the Proposed Action with Housing Option H2. Temporary housing units such as hotel/motel rooms would not be affected by this change.

City of Lewistown. The construction work on the launch facilities in the Lewistown area is expected to bring a peak of 55 new households to the City of Lewistown in 1992. It is estimated that these workers would require 40 permanent units and 15 temporary units in 1992 (the peak year). An additional 15 temporary units may be required to house weekly commuters in the same year. The supply of available vacant permanent units in the city of Lewistown is projected to be adequate to meet this demand with no change in the cost of housing experienced by projected baseline residents. During the peak tourist season in 1992, the supply of temporary housing units would not be exhausted.

The program-related demand for housing in the City of Lewistown is expected to help the local housing market without any displacement of local citizens or price increases to current residents. Therefore, Alternative 2 is expected to have a beneficial short-duration impact on housing. There are no long-duration program-related impacts on housing in the City of Lewistown.

City of Conrad. The construction work on the launch facilities near Conrad is expected to reach a peak in 1993. It is expected that about 30 new households would reside in Conrad in that year. It is estimated that these workers would require 20 permanent units and 10 temporary units in 1993. An additional ten temporary units may be required to house weekly commuters in the same year. The supply of rental units and the availability of hotel/motel rooms in Conrad is expected to be sufficient to accommodate this short-duration increase in demand.

The program-related demand for housing in the City of Conrad is expected to help the local housing market without displacement of any local citizens or price increases to any current residents; therefore, the short-duration impacts of Alternative 2 on the housing market in Conrad are expected to be beneficial. There are no long-duration program-related housing impacts for the City of Conrad.

Alternative 3. Housing requirements under Alternative 3 would be virtually the same as those presented for the Proposed Action; consequently, LOIs and significance determinations would remain the same.

4.1.3.4 Education

Alternative 1.

City of Great Falls. Compared to the Proposed Action, Alternative 1 would bring 350 fewer students (Table 4.1.3-3) during the operations phase to the GFPS system since fewer operations personnel are required. Of these total projected decreases in enrollments, slightly more than half are expected to be elementary students. Loy Elementary School, located just outside Malmstrom AFB, will be most affected by the program-related enrollments. Although fewer students are projected for this alternative, the overall elementary enrollment increase of 425 estimated for Loy Elementary School would seriously overcrowd the school. This would be a long-duration impact. The increased enrollment represents an additional 18 pupils per classroom, and added to the baseline pupil-to-teacher ratio, is much higher than local or state maximum standards. Therefore, the LOI and significance evaluation of Alternative 1 would be similar to the Proposed Action and would remain high and significant.

Table 4.1.3-3

1990-91 Through 2000-01 Great Falls Public Schools Projected Enrollment for the Proposed Action, Alternative 1, Alternative 2, Alternative 3, and Cumulative Impacts

	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96
Proposed Action	123	210	600	786	870	1,058
Alternative 1	122	210	541	648	696	797
Alternative 2	126	218	613	802	874	1,077
Alternative 3	123	210	600	786	870	1,058
Cumulative Impacts	123	210	659	904	987	1,174

	1996-97	1997-98	1998-99	1999-2000	2000-01
Proposed Action	1,299	1,256	1,216	1,210	1,210
Alternative 1	942	901	861	858	858
Alternative 2	1,467	1,539	1,538	1,509	1,472
Alternative 3	1,299	1,256	1,216	1,210	1,210
Cumulative Impacts	1,416	1,374	1,333	1,330	1,330

City of Lewistown. Compared to the Proposed Action, Alternative 1 would bring a few more students to the Lewistown Public Schools. However, the negligible impact evaluation of the Proposed Action would remain unchanged because of the ability of the Lewistown Public Schools to handle increased enrollments.

City of Conrad. The inmigration projections to Conrad for the Proposed Action and Alternative 1 are the same. Therefore, the negligible impact evaluation of the Proposed Action would remain unchanged.

Alternative 2.

City of Great Falls. Compared to the Proposed Action, Alternative 2 with programmed housing onbase would bring around 260 more students (Table 4.1.3-3) to the GFPS system during the operations phase. Slightly more than one-half of these projected enrollments would increase enrollments at Loy Elementary School by approximately 72 percent. The increased enrollment represents an additional 32 pupils per classroom, and added to the baseline pupil-to-teacher ratio, is much higher than local or state maximum standards. Therefore, the evaluation of LOI and significance for the Proposed Action of high and significant is applicable to Alternative 2.

If no military family housing were built onbase, elementary enrollments are projected to be distributed to schools located west and southwest of Malmstrom AFB. Chief Joseph, Lewis and Clark, Morningside, Mountain View, and Sunnyside elementary schools would be affected. About 580 elementary students out of the 810 projected for the operations years are expected to attend these five schools resulting in a pupil-to-teacher ratio of over 31-to-1. This compares to a ratio of 30-to-1 for the Proposed Action with offbase housing (Housing Option H2). In both of these cases the resulting impacts are considered high and significant.

City of Lewistown. Compared to the Proposed Action, Alternative 2 would bring a few more students to the Lewistown Public Schools. However, the negligible impact evaluation of the Proposed Action would remain unchanged.

City of Conrad. Compared to the Proposed Action, Alternative 2 may bring a few more students to the Conrad Public Schools. However, the negligible impact evaluation of the Proposed Action would remain unchanged.

Alternative 3. Education requirements under Alternative 3 are the same as those presented for the Proposed Action; consequently, the LOIs and significance determinations would remain the same as for the Proposed Action.

4.1.3.5 Public Services

Alternative 1. Under Alternative 1, there would be a smaller population influx associated with the program compared to the Proposed Action. This reduction in population would lead to a concomitant reduction in demands placed on public services in the ROI. The major effects of this reduction would be felt by the jurisdictions of Great Falls and Cascade County. Under Alternative 1, Cascade County would need five fewer positions as compared to the Proposed Action, with the Sheriff's Department needing one less deputy. Changes in impacts in the other cities and counties would be minor. Overall, short-duration impacts would remain moderate and not significant. Long-duration impacts are evaluated as low because of increases in calls for service per officer in the Cascade County Sheriff's Department and the Great Falls Police Department of up to 6 percent. Impacts would be significant because of the existing overcapacity of the jail and lack of funding for a new one.

Alternative 2. Under Alternative 2 with programmed housing onbase, there will be a larger population influx associated with the program compared to the Proposed Action. This increase in population would lead to a concomitant increase in demands placed on public services in the ROI, especially in the City of Great Falls and Cascade County. Under Alternative 2, Cascade County would need three more positions in 1996 as compared to the Proposed Action and five more positions during the operations phase as compared to the Proposed Action. The Sheriff's Department would need one additional deputy. Changes in impacts in the other cities and counties would be minor. Overall short-duration impacts would remain moderate and not significant. Long-duration impacts are evaluated as high because of increases in calls for service per officer greater than 10 percent for the Cascade County Sheriff's Department. Impacts would be significant due to the current lack of capacity in the jail for additional prisoners and lack of funding for facility expansion.

If no military family were built onbase, an additional six city government employees would be required in order to maintain existing service levels during the operations years. This would bring the total employment requirement for the city to 456 as

compared to 450 for the Proposed Action with Housing Option H2. Calls for service for the Great Falls Police Department are projected to reach 25,100 annually, about 500 greater than for the Proposed Action with Housing Option H2. As a result, calls per officer would rise from about 9 percent above baseline under the Proposed Action with Housing Option H2 to nearly 12 percent under Alternative 2 with Housing Option H2. This would change public service impacts for Alternative 2 in the City of Great Falls from moderate and not significant to high and not significant, because calls per officer would be greater than the 10 percent criteria for high LOI. This change would not affect the overall rating for public services which would remain high and significant for Alternative 2.

Alternative 3. Public service demands under Alternative 3 are about the same as those presented for the Proposed Action. Consequently, overall LOIs and significance determinations would remain moderate and not significant for short-duration impacts and high and significant for the long-duration impacts.

4.1.3.6 Public Finance

Alternative 1. Lower employment and population levels under this alternative as compared to the Proposed Action result in lower service demands and, subsequently, lower expenditure requirements by the potentially affected local government units in the study area. The lower employment and population levels also effectively result in lower property taxes collected, lower state intergovernmental transfers, and lower revenues from the other nontax revenue sources. Program-induced revenues and expenditures would be approximately one-third less than those estimated under the Proposed Action. Revenue shortfalls would also decrease similar levels. However, the fiscal impacts would remain the same for each jurisdiction as those evaluated under the Proposed Action.

Program-induced revenue increases for the City of Great Falls are estimated to increase gradually over the FY 1990 to FY 1996 period under this alternative, reaching approximately $1.2 million by FY 1996 and stabilizing at approximately $1.1 million in FY 2000 and thereafter (Table 4.1.3-4). Program-induced expenditure increases follow a similar pattern, growing to approximately $1.2 million by FY 1996 and stabilizing at $1.1 million in FY 2000 and thereafter. Shortfalls of under $100,000 are estimated in FY 1990 and in FY 1992 through FY 2000 and thereafter. These shortfalls would represent less than 0.5 percent of the city's projected budget over these years. Capital facility requirements would remain the same as under the Proposed Action.

Long-duration, fiscal impacts would occur for the City of Great Falls because program-induced revenue shortfalls would persist throughout most of the years during the buildup phase and continue over the life of the program. Impacts would be moderate because the revenue shortfalls are less than those historically experienced by the city. The impact would not be significant because the cumulative effect of the shortfalls would not reduce fund balances below historical levels.

Cascade County program-induced revenues are estimated to increase gradually under this alternative over the FY 1990 to FY 1996 period, reaching approximately $530,000 in FY 1996 and stabilizing at approximately $470,000 in FY 2000 and thereafter. Program-induced expenditures are estimated to grow to approximately $720,000 by FY 1996 and stabilize at $660,000 in FY 2000 and thereafter. Annual revenue shortfalls ranging up to $190,000 are estimated over the FY 1990 to FY 1999 period. Long-duration revenue shortfalls are estimated to be approximately $180,000 in FY 2000 and thereafter. Capital facility requirements would remain the same under this alternative as under the Proposed Action.

Long-duration, fiscal impacts would occur for the school district because program-induced revenue shortfalls would persist throughout the buildup phase and continue over the life of the program. Impacts would be moderate because the revenue shortfalls are less than those historically experienced by the district. The impact would be significant because the cumulative effects of the shortfalls would reduce fund balances below historical levels by FY 1993.

For the Great Falls High School District No. A, program-induced revenues are estimated to increase gradually over the FY 1990 to FY 1998 period, reaching approximately $960,000 in FY 1998 and stabilizing at $880,000 in FY 2000. Program-induced expenditures are estimated to peak in FY 1997 at $1 million and stabilize at $910,000 in FY 2000. Revenue shortfalls ranging up to $230,000 in FY 1993 are estimated over the buildup phase. Small surpluses are registered in the following 2 years and annual shortfalls of approximately $30,000 are estimated to continue for the life of the program.

Long-duration, moderate impacts would occur because program-induced revenue shortfalls are estimated over the buildup phase and would continue over the life of the program but at levels below those historically experienced. Because these shortfalls would reduce fund balances below historical levels by FY 1997, the fiscal impacts for the high school district are judged significant.

Alternative 2. Higher employment and population levels under this alternative with programmed housing onbase result in higher service demands and, subsequently, higher expenditure requirements. The higher employment and population levels would also result in higher property taxes collected, higher state intergovernmental transfers, and higher revenues from the other nontax revenue sources. Program-induced revenues and expenditures would be approximately 20 percent greater than those estimated under the Proposed Action. Fiscal impacts, however, would remain the same for each jurisdiction as those evaluated under the Proposed Action.

Program-induced revenues for the City of Great Falls under this alternative are estimated to increase gradually over the FY 1990 to FY 1997 period, reaching approximately $1.9 million by FY 1997 and stabilizing at approximately $1.8 million in FY 2000 and thereafter (Table 4.1.3-4). Program-induced expenditure increases follow a similar pattern, growing to approximately $2 million by FY 1997 and stabilizing at $1.9 million in FY 2000 and thereafter. Shortfalls of under $100,000 are estimated in FY 1990 and in FY 1992 to 1995 and are about $110,000 in FY 2000 and thereafter. Capital facility requirements would remain the same under this alternative as under the Proposed Action.

Long-duration, fiscal impacts would occur for the city because program-induced revenue shortfalls would persist throughout most of the years during the buildup phase and continue over the life of the program. Impacts would be moderate because the revenue shortfalls are less than those historically experienced by the city but would persist over the buildup phase and would continue over the life of the program. The impact would not be significant because the size of the shortfalls would not reduce fund balances below historical levels.

The net fiscal effects of Alternative 2 if no onbase housing were built onbase would follow a similar pattern as those estimated for the Proposed Action under Housing Option H2. Because of the offbase housing developed under this housing option, project-induced revenues would increase to approximately $2.1 million by FY 2000 while project-induced expenditures would remain approximately the same at about $2.0 million. Because project-induced revenues exceed expenditures in most years over the buildup

Table 4.1.3-4

Fiscal Impacts of Alternatives 1 and 2 for the City of Great Falls and Cascade County, Montana
FY 1990-2000
(thousands 1986$)

	Fiscal Year										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Alternative 1											
City of Great Falls											
Revenues	$135.0	$291.0	$681.0	$854.0	$908.0	$1,010.0	$1,182.0	$1,153.0	$1,086.0	$1,071.0	$1,070.0
Expenditures	158.0	248.0	738.0	860.0	913.0	1,065.0	1,232.0	1,183.0	1,137.0	1,133.0	1,133.0
Net	-23.0	44.0	-57.0	-5.0	-5.0	-55.0	-50.0	-31.0	-50.0	-62.0	-63.0
Cascade County											
Revenues	$64.0	$159.0	$303.0	$401.0	$422.0	$455.0	$526.0	$525.0	$487.0	$474.0	$473.0
Expenditures	86.0	184.0	447.0	519.0	550.0	617.0	716.0	687.0	659.0	657.0	657.0
Net	-22.0	-24.0	-144.0	-117.0	-128.0	-162.0	-190.0	-162.0	-172.0	-183.0	-184.0
Alternative 2											
City of Great Falls											
Revenues	$140.0	$305.0	$769.0	$1,045.0	$1,133.0	$1,349.0	$1,807.0	$1,933.0	$1,925.0	$1,882.0	$1,840.0
Expenditures	163.0	256.0	821.0	1,074.0	1,153.0	1,385.0	1,907.0	2,027.0	2,026.0	1,993.0	1,953.0
Net	-22.0	48.0	-52.0	-29.0	-20.0	-36.0	-100.0	-94.0	-100.0	-110.0	-114.0
Cascade County											
Revenues	$67.0	$167.0	$341.0	$484.0	$523.0	$599.0	$786.0	$864.0	$869.0	$846.0	$826.0
Expenditures	90.0	190.0	496.0	623.0	708.0	806.0	1,108.0	1,196.0	1,195.0	1,175.0	1,150.0
Net	-23.0	-23.0	-155.0	-139.0	-185.0	-207.0	-322.0	-332.0	-326.0	-329.0	-324.0

Note: Data reflect revenues and expenditures of general fund, special revenue, and capital projects funds. Net values may not reflect differences due to rounding.

phase and continue over the life of the project, fiscal impacts under Housing Option H2 are considered beneficial.

Cascade County program-induced revenues are estimated to increase gradually over the FY 1990 to FY 1997 period, reaching approximately $870,000 in FY 1998 and stabilizing at approximately $830,000 in FY 2000 and thereafter if military family housing is provided onbase. Program-induced expenditures are estimated to grow to approximately $1.2 million by FY 1997 and stabilize at approximately this level in FY 2000 and thereafter. Annual revenue shortfalls ranging up to $330,000 are estimated over the FY 1990 to FY 1997 period. Long-duration revenue shortfalls are estimated to be approximately $320,000 in FY 2000 and thereafter.

Long-duration, fiscal impacts would occur in Cascade County because program-induced revenue shortfalls would persist throughout the buildup phase and continue over the life of the program. Impacts would be moderate because the revenue shortfalls are less than those historically experienced by the county. The impact would be significant because the cumulative effect of the shortfalls would reduce fund balances below historical levels by FY 1995.

If no additional military family housing were built onbase, the offbase housing development assumed under this scenario would increase revenues available to the county compared to the other scenarios. Project-induced revenue increases are estimated to reach approximately $1.1 million by FY 1997 and stabilize at approximately $1.0 million in FY 2000 and thereafter. Although project-induced expenditures would remain the same as under the programmed housing option, the estimated revenues under this housing scenario still are not sufficient to meet project-induced expenditure demands. Revenue shortfalls ranging up to approximately $170,000 in FY 1996 and $120,000 in FY 2000 and thereafter are estimated. Fiscal impacts would remain moderate and significant.

For the Great Falls Elementary School District No. 1, program-induced revenues are estimated to increase gradually over the FY 1990 to FY 1999 period, reaching approximately $2.6 million in FY 1999 and stabilizing at $2.5 million in FY 2000 if military family housing is provided onbase (Table 4.1.3-5). Program-induced expenditures are estimated to peak in FY 1998 at $2.7 million and stabilize at $2.6 million in FY 2000. Because of the lag between when state foundation monies and property taxes are received by the district and when the additional pupils arrive, revenue shortfalls ranging up to $540,000 in FY 1997 are estimated. Long-duration annual revenue shortfalls of approximately $90,000 are estimated.

Long-duration, fiscal impacts would occur to School District No. 1 because program-induced revenue shortfalls would persist throughout the buildup phase and continue over the life of the program. Impacts would be moderate because the revenue shortfalls are less than those historically experienced by the district. The impact would be judged significant because the cumulative effect of the shortfalls would reduce fund balances below historical levels by FY 1993.

With no military family housing built onbase, project-induced elementary school district expenditures would be the same as under the programmed housing option. No new elementary facilities would be required in the immediate area of the base under this housing option, though expansion or renovation of existing facilities in other areas would be required. Because the district would stand to receive less federal aid under this housing scenario than would be recovered in property taxes as more housing is developed offbase and because of the lag between state foundation monies and property taxes are received by the district compared to when the additional pupil arrive, revenue shortfalls

Table 4.1.3-5

Fiscal Impacts of Alternatives 1 and 2 for the Great Falls Elementary and High School Districts, School Years 1990-2001 (thousands 1986$)

	School Years										
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Alternative 1											
Elementary District No. 1											
Revenues	$71.0	$293.0	$563.0	$1,012.0	$1,152.0	$1,248.0	$1,430.0	$1,575.0	$1,498.0	$1,446.0	$1,441.0
Expenditures	215.0	370.0	955.0	1,144.0	1,229.0	1,407.0	1,664.0	1,590.0	1,520.0	1,514.0	1,514.0
Net	-143.0	-77.0	-391.0	-132.0	-77.0	-158.0	-234.0	-15.0	-22.0	-68.0	-73.0
High School District No. A											
Revenues	$47.0	$179.0	$351.0	$620.0	$705.0	$766.0	$879.0	$964.0	$918.0	$887.0	$884.0
Expenditures	130.0	223.0	576.0	690.0	741.0	849.0	1,004.0	960.0	917.0	914.0	914.0
Net	-83.0	-45.0	-225.0	-70.0	-37.0	-82.0	-125.0	5.0	1.0	-27.0	-29.0
Alternative 2											
Elementary District No.1											
Revenues	$73.0	$305.0	$618.0	$1,187.0	$1,436.0	$1,622.0	$2,049.0	$2,499.0	$2,575.0	$2,551.0	$2,507.0
Expenditures	223.0	384.0	1,082.0	1,415.0	1,542.0	1,901.0	2,590.0	2,717.0	2,714.0	2,664.0	2,599.0
Net	-150.0	-79.0	-464.0	-228.0	-106.0	-279.0	-541.0	-218.0	-140.0	-112.0	-91.0
High School District No. A											
Revenues	$48.0	$186.0	$385.0	$729.0	$879.0	$997.0	$1,264.0	$1,534.0	$1,579.0	$1,565.0	$1,537.0
Expenditures	135.0	232.0	653.0	854.0	931.0	1,147.0	1,563.0	1,640.0	1,638.0	1,607.0	1,568.0
Net	-87.0	-46.0	-268.0	-125.0	-51.0	-150.0	-299.0	-105.0	-59.0	-43.0	-31.0

Note: Net values may not reflect differences due to rounding.

ranging up to $550,000 in FY 1993 and $170,000 in FY 2000 and thereafter are estimated. Fiscal impacts to the elementary district would remain moderate and significant.

For the Great Falls High School District No. A, program-induced revenues are estimated to increase gradually over the FY 1990 to FY 1999 period, reaching approximately $1.6 million in FY 1999 and stabilizing at $1.5 million in FY 2000 if military family housing is provided onbase. Program-induced expenditures are estimated to peak in FY 1998 at $1.6 million and stabilize at approximately these levels in FY 2000. Revenue shortfalls ranging up to $300,000 in FY 1997 are estimated over the buildup phase. Shortfalls of approximately $30,000 per year are estimated over the operations life of the program.

Long-duration, fiscal impacts would occur in the high school district because program-induced revenue shortfalls would persist over the buildup phase and continue over the life of the program. Impacts would be moderate because the revenue shortfalls are less than those historically experienced by the district. The impact is judged significant because the cumulative effect of the shortfalls would reduce fund balances below historical levels by FY 1996.

With no military family housing built onbase, project-induced high school district expenditures would be the same as under the programmed housing option. Because the district would stand to receive less federal aid under this housing option than would be recovered in property taxes as more housing is developed offbase, project-induced revenues would be less than under the programmed housing option and revenue shortfalls ranging up to $320,000 in FY 1993 and $80,000 in FY 2000 are estimated. Fiscal impacts to the high school district would remain moderate and significant.

Alternative 3. Public finance effects under Alternative 3 are the same as those presented for the Proposed Action. Consequently, LOIs and significance determinations would remain the same for each jurisdiction.

4.1.4 Cumulative Impacts

4.1.4.1 Economic Base

Simultaneous deployment of the Peacekeeper in Rail Garrison and the Small ICBM at Malmstrom AFB would slightly increase the effects of Small ICBM deployment alone. Cascade County employment and income benefits would be larger. Construction-sector effects from 1991 through 1993 would be somewhat exacerbated, but would still be only moderate and not significant. Total regional jobs created by the Small ICBM and Peacekeeper (most of which would be in Cascade County) would reach 5,040 in 1993, 5,150 in 1996, and 4,725 by the year 2000.

The Peacekeeper in Rail Garrison program at Malmstrom AFB is not expected to have any measurable adverse or beneficial economic effects on Fergus or Pondera counties. Short- and long-duration cumulative impacts would remain moderate and not significant.

4.1.4.2 Demographics

Deploying the Peacekeeper in Rail Garrison basing mode at Malmstrom AFB is expected to add about 700 people to the military population of the Great Falls area. This additional population is not expected to change the level or significance of area demographic effects (Table 4.1.4-1). Long-duration cumulative impacts would remain moderate and significant.

Table 4.1.4-1

Population Impacts of the Proposed Action and Peacekeeper in Rail Garrison Basing Mode Great Falls, Montana (1990-2000)

	Calendar Year					
	1990	1991	1992	1993	1994	1995
Proposed Action	770	1,310	3,750	4,910	5,440	6,610
Rail Garrison	0	0	370	740	730	730
Cumulative	770	1,310	4,120	5,650	6,170	7,340

	Calendar Year				
	1996	1997	1998	1999	2000
Proposed Action	8,120	7,850	7,600	7,580	7,580
Rail Garrison	730	740	730	730	730
Cumulative	8,850	8,590	8,330	8,310	8,310

4.1.4.3 Housing

The basing of the Peacekeeper in Rail Garrison would add an additional 160 new onbase units to the supply of housing units at Malmstrom AFB. It is not expected that any private housing response would occur within the urban area. In 1992, 90 new onbase units would be completed with the remaining 70 units completed in 1993. An additional 30 military households would live offbase, decreasing the vacancy rate by 0.1 percentage points during the operations phase. The demand for onbase dormitory modules would increase by 50 because of the Peacekeeper in Rail Garrison program. These facilities will be provided onbase. The demand for temporary offbase units is not expected to change because of the Peacekeeper in Rail Garrison, and there would be no additional impacts on housing in the Great Falls area. The long-duration cumulative impacts on the housing market in the Great Falls urban area would remain moderate and not significant as shown under the Proposed Action. Short- and long-duration beneficial effects would continue.

4.1.4.4 Education

City of Great Falls. Compared to the Proposed Action the cumulative impacts of the Proposed Action and the Peacekeeper in Rail Garrison and the Small ICBM programs would increase by 120 students (Table 4.1.3-3), of which 66 are estimated to be elementary school-age children. The LOI and significance evaluation of the Proposed Action would remain unchanged as high and significant for long-duration cumulative impacts.

City of Lewistown. The Lewistown Public Schools would not be affected by the Peacekeeper in Rail Garrison program. Therefore, the LOI and significance assessment of negligible would remain unchanged.

City of Conrad. The Conrad Public Schools would not be affected by the Peacekeeper in Rail Garrison program. Therefore, the LOI and significance assessment of negligible would remain unchanged.

4.1.4.5 Public Services

The concurrent basing of the Peacekeeper in Rail Garrison at Malmstrom AFB is expected to bring in an additional 700 people to the Great Falls area. This increase in population, above the effects of the Proposed Action, is projected to create the need for two additional personnel in government employment for both the City of Great Falls and Cascade County. No measurable effects are expected to be felt in the other areas of study. Short-duration cumulative impacts on public services would remain the same as those evaluated for the Proposed Action, moderate and not significant. Long-duration impacts would remain moderate and significant.

4.1.4.6 Public Finance

With concurrent deployment of Peacekeeper in the Rail Garrison basing mode at Malmstrom AFB, revenues and expenditures of the potentially affected jurisdictions would be slightly higher than under the Proposed Action alone. Program-induced revenues and expenditures of the city, county, and school districts would increase approximately 9 to 10 percent over levels estimated under the Proposed Action. Because of the little effect onbase development has upon the tax base of the jurisdictions and the relatively small employment increases associated with the Peacekeeper in Rail Garrison program relative to the Proposed Action, revenue shortfalls would increase only slightly. Impacts would remain the same as those evaluated for the Proposed Action.

4.1.5 Impacts of the No Action Alternative

Under the No Action Alternative, socioeconomic activity associated with maintenance of the current Minuteman force and other missions would continue indefinitely at Malmstrom AFB.

Employment and population in north-central Montana are projected to increase gradually through the year 2000 without the Proposed Action or alternatives. Most of this growth would be concentrated in Great Falls and Helena, with little growth or modest declines expected in the rural counties. Unemployment rates should decrease to a regional average of 6 percent. The military population (active-duty personnel plus dependents) of the Great Falls area should stay at about 10,500 persons, or 15.2 percent of total community population. Some anticipatory growth, followed by decline, is likely if individuals and businesses speculate on the likelihood that the program would be implemented.

The supply of housing units in the Great Falls area is expected to increase from about 30,900 units in 1990 to 30,500 units by the year 2000. The vacancy rate for available units is expected to decline slightly from 3.5 to 3.1 percent during this period. No increase in housing stock or vacancy rates is projected for either Lewistown or Conrad.

The GFPS enrollments have steadily decreased since 1976-77, from a total of 16,579 students to a 1986-87 enrollment of 12,193. Enrollments are expected to increase gradually over the next 10 years, to about 13,300 in the year 2000-01. Staffing levels have followed the enrollment trend, and some school buildings have been closed since the peak year of enrollments in 1970-71 at around 20,000 students. Under baseline conditions, it is likely that additional staff would be hired and that one or more empty schools may be reopened to accommodate the increased enrollment.

The enrollment in the Lewistown Public Schools peaked in 1977-78 at 2,138 students and has been declining to an enrollment of 1,631 students in 1986-87. The projected enrollments for the Lewistown Public Schools is to remain stable, if not slightly decrease in the next few years.

The Conrad Public Schools enrolled around 1,500 students in 1976-77, but enrollments have decreased since that time to 742 students in 1986-87. The enrollments at the Conrad Public Schools are expected to remain stable with the exception of an increase of approximately 20 to 40 students expected in 1988 as a result of an Air Force Strategic Training Range detachment locating in Conrad.

Under the No Action Alternative, the City of Great Falls government is projected to need an additional 17 personnel by the year 2000, including four additional sworn officers for the Police Department. Cascade County government is projected to need an additional 14 personnel by the year 2000, including two more deputies in the Sheriff's Department. The Cascade County jail would be further burdened by the added use resulting from population growth. Current staffing and facilities for public services in other jurisdictions under study are projected to be adequate to meet the needs of the communities in the near future.

Revenues and expenditures of the City of Great Falls are estimated to remain around current levels through FY 1988 and gradually increase to historic levels by the 1990s. However, revenues and expenditures of Cascade County are expected to continue to decline if current trends continue. Improvements in the county's fiscal position is assumed to be limited to a stabilization of revenues and expenditures at these lower levels. School district revenue and expenditure levels are assumed to increase slightly as projected enrollments increase, assuming state foundation program monies remain at current per pupil rates.

4.1.6 Potential Mitigation Measures

Potential mitigations are measures that could be undertaken to reduce or eliminate program impacts. All, some, or none of the measures identified for socioeconomics may be implemented. For each measure, the agencies that may be involved in implementation are identified. The Air Force would encourage implementation of these measures through environmental awareness and other programs. Potential mitigation measures for socioeconomics include the following:

- Package contracts to afford local firms with limited bonding capacities the opportunity to bid on contracts. Contract awards to local firms would reduce population inmigration during the construction phase and enhance local revenues (Army Corps of Engineers and the Federal Highway Administration).

- Provide program personnel with information that will assist them in the process of assimilation into the community. The U.S. Air Force and local

organizations should work together to implement this plan before the construction phase starts. This information should describe the character of the community and its people, cultural opportunities, human service organizations, health care facilities, and recreation areas (U.S. Air Force and local organizations).

- Monitor socioeconomic changes in the area to provide up-to-date projections of key indicators and identify deviations in projected impacts. This measure would allow the U.S. Air Force, in conjunction with state agencies, to develop new mitigation measures or revise existing measures, as required. Examples of indicators that could be incorporated include: program employment, inmigration, demographic characteristics, earnings, housings, school enrollments, service demands for public services, and revenues and expenditures of different jurisdictions (U.S. Air Force and state and local agencies).

- Distribute housing demand information to the public in order to improve market response (U.S. Air Force and local governments).

- Seek an increase in federal and state support for low-income housing assistance in the Great Falls urban area, and insure that qualifying military families receive the portion of total assistance which accrues due to their presence in the Great Falls area. This would give eligible lower-ranking military personnel more money to spend on housing, thereby increasing their ability to obtain affordable housing units which meet onbase standards (Great Falls Housing Authority and the U.S. Air Force).

- Explore alternative approaches to providing federally funded housing (e.g., Section 801 and 802 programs) for U.S. Air Force families in the Great Falls area. Such a program should focus on the housing requirements of lower-paid enlisted personnel and their dependents, (U.S. Air Force).

- Review and update land development policies in Great Falls to expand opportunities for low-cost housing in the urban service area. This measure would provide affordable family housing for military personnel, better distribute the inmigrant population, and reduce local impacts to schools and other services (local governments).

- Develop measures to accommodate increased school enrollment associated with inmigrating program personnel. Measures to be considered include:

  - Establish a working group to (1) better define the extent and timing of the educational impact problems, (2) research possible alternative solutions to these problems, (3) suggest preferred mitigations. This working group would include superintendents of schools, the state superintendent of public instruction, and appropriate U.S. Air Force and other federal officials (state school officials, U.S. Air Force, other federal agencies).

  - Hire additional staff to maintain satisfactory pupil-to-teacher ratios. District-wide elementary teacher requirements are projected to be approximately 25 to 30 additional teachers. This measure would provide staffing levels similar to levels experienced over the past 10 years (Great Falls Public Schools).

- Redefine the elementary school attendance boundaries to better utilize existing facilities. This mitigation would retain the neighborhood school concept, would distribute new enrollments more evenly, but would likely require more busing for elementary students (Great Falls Public Schools).

- Purchase additional new school buses, as required, to transport students from Malmstrom AFB to area schools. This measure would be effective in reducing pressure for new facilities around the Malmstrom AFB area but would not support the maintenance of the neighborhood school concept within the Great Falls Public Schools (Great Falls Public Schools).

- Convert the currently vacant Paris Gibson Junior High School to an elementary school. The Paris Gibson Junior High School is currently not utilized for regular classroom purposes. Conversion to an elementary school would be effective in reducing pressure for new facilities around the Malmstrom AFB area, but would require more busing for elementary enrollments. In relieving the overcrowding of elementary facilities by this conversion, the existing junior high schools may experience some facility constraints (Great Falls Public Schools).

- Convert to a middle school concept whereby grades 6-8 would enroll in middle schools, thereby removing grade 6 from overcrowded elementary schools. This would provide the use of over 30 additional classrooms for grades K-5, but would require that the existing two operational junior high schools and one empty junior high absorb the sixth grade enrollments (Great Falls Public Schools).

- Maximize participation in P.L. 81-874 entitlement program by encouraging parents who live or work on federal facilities to respond to school district requests for information. This federal program provides aid to local school districts which have had substantial increases in school enrollments as a result of new or expanded federal activities. If program-related student enrollments increase during the spring rather than the fall term, request an additional survey audit to establish the need for increased funding. (U.S. Air Force, Great Falls Public Schools, and Montana Office of Public Instruction).

- Explore possible classification of students associated with this program into Super A or Super B categories rather than Regular A or Regular B categories as is the current situation. Such a reclassification would lead to priority funding as opposed to residual funding for impact students (Great Falls Public Schools, DOD, Department of Education, U.S. Air Force).

- Pursue funding for new facilities under the School Assistance in Federally Affected Areas Program (P.L. 81-815). This program has very limited current funding. Application is made to the Secretary of Education through the state educational agency (Great Falls Public Schools, Montana Office of Public Instruction, and the U.S. Air Force).

- If the programmed housing option is used under any of the proposed alternatives, a P.L. 81-874 Section 6 elementary school could be constructed in the new housing neighborhood. Section 6 schools are built on federal land, but could be administered by the local public school administration and

school board. This program has limited current funding. (Great Falls Public Schools, Montana Office of Public Instruction, and the U.S. Air Force).

- Construct an elementary school in Great Falls as necessary to maintain the neighborhood school concept. This school would incorporate facilities for a special education magnet program to serve the base and community at large. For example, Loy Elementary School is the elementary school serving the Malmstrom AFB area: under the programmed housing option, it would experience a projected increase of approximately 600 elementary students during the operations phase which would more than double current enrollment. The Great Falls Public Schools have a tradition of neighborhood elementary schools. This measure would be effective in maintaining this concept and provide the needed classrooms and facilities required by program-induced enrollment increases (Great Falls Public Schools).

- Explore P.L. 81-874 Section 2 (In Lieu of Property Taxes Provision) and Section 3(d) 2(B) (The Need Area Provision) as potential funding sources for impacted school districts.

• Develop cooperative agreements with neighboring counties to help alleviate overcrowding in Cascade County jail. This measure would reduce overcrowding at the jail as well as circumvent the need for reduced prison sentences and early releases brought on by the overcrowding. The Cascade County Sheriff's Department should work out the feasibility of this approach with the respective agencies in the area (Cascade County).

• Supply detailed construction site maps and schedules to emergency services agencies who operate in and around the construction areas. This measure would alleviate problems of access to worksites as well as reduce response times. The U.S. Air Force should initiate this process before the start of the construction phase (U.S. Air Force).

• Explore alternative sources of state and federal funding to provide for additional staff, and equipment, for local governments. These additional inputs would allow for the maintenance of existing service levels. Affected agencies should explore opportunities as early as possible because of lead time associated with this type of funding (City of Great Falls and Cascade County).

4.1.7 Irreversible and Irretrievable Resource Commitments

The proposed program requires the use of substantial quantities of labor, materials, and other economic resources during both the construction and operations phases. The expected population inmigration and the local procurement of building materials (such as cement, sand, and gravel) may alter some resource characteristics in the deployment area. Although these economic factors, once used by the proposed program, generally cannot be recovered for other purposes, the extent of their use will be small in comparison to total resource availability.

4.1.8 Relationship Between the Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Regional multicounty socioeconomic consequences of the proposed program on the use of the environment will be minimal during both the construction and operations years. Over the expected life of the proposed program, additional economic activity will enhance productivity in all regions considered.

4.2 Utilities

Deployment of the Small Intercontinental Ballistic Missile (ICBM) program at Malmstrom Air Force Base (AFB) would create direct and indirect impacts to utility systems serving Great Falls, Montana and the surrounding area. Direct impacts are the result of program-related construction and operations activities. Indirect impacts would result from the associated population changes. Both beneficial and adverse impacts are addressed. The analysis of impacts includes the potable water treatment and distribution systems, wastewater systems, solid waste collection and disposal facilities, and energy utilities.

4.2.1 Impact Analysis Methodology

The impact analysis methodology for utilities involved three separate procedures: evaluation of program impacts, determination of levels of impact (LOI), and determination of the significance of impacts. The methodology also included consideration of a number of assumptions and assumed mitigations. Impacts were evaluated at the local level since the impacts will affect local public and private utility systems. An overall collective assessment was made for each resource element.

4.2.1.1 Evaluation of Program Impacts

Potable Water Treatment and Distribution. Direct potable water treatment impacts were derived by evaluating types, rates, durations, and locations of water requirements. Indirect potable water treatment rates were estimated using population projections provided by the socioeconomic analysis (Section 4.1.2, Table 4.1.2-2). Per capita rates were individually developed for Great Falls, Malmstrom AFB, Lewistown, and Conrad after reviewing historic demands (Section 4.9.1.1). These rates were then multiplied by the projected population to obtain an estimate of the potable water treatment capacity needed. Locations of these demands and proposed growth within the Region of Influence (ROI) are identified in the impact analysis.

Changes in demand were estimated by comparing demands in the ROI with and without the program. Both direct and indirect demands were included. Demands are expressed in gallons per minute (gpm) or million gallons per day (MGD), and as a percent increase over the projected demands without the program. Any new capacity constructed as part of the proposed program was included in the impact analysis.

Cost changes were calculated by comparing the costs of operations and maintenance both with and without the program. Additional costs resulting from the program (e.g., new facilities, equipment, or employees) were determined and included in the impact analysis.

Wastewater. Direct wastewater impacts were derived by evaluating the types, rates, duration, and location of wastewater requirements. Indirect wastewater treatment flows were estimated using population projections provided by the socioeconomic analysis (Section 4.1.2, Table 4.1.2-2). Per capita wastewater flows were developed from historic data and estimates of future use. These rates were then multiplied by the projected population to obtain an estimate of the wastewater treatment capacity needed. Locations of these demands and proposed growth within the ROI were included in the impact analysis.

Changes in demand were estimated by comparing demands in the ROI with and without the program. Both direct and indirect demands were included. Demands are expressed

in gpm or as MGD, and as a percent increase over the projected demands without the program. Any new capacity constructed as part of the proposed program was included in the impact analysis.

Cost changes were calculated by comparing the costs of operation and maintenance both with and without the program. Additional costs resulting from the proposed program (e.g., new facilities, equipment, or employees) were determined and were included in the impact analysis.

Solid Waste. Solid waste impacts were derived by evaluating the types, rates, duration, and location of wastes generated as a result of the program. Direct solid wastes generated from construction activities were estimated using an average of 0.6 pounds per construction worker per day. Indirect solid waste generation rates were estimated using population projections provided by the socioeconomic analysis (Section 4.1.2, Table 4.1.2-2). Per capita waste generation rates were developed from historic data and were multiplied by the projected population to obtain an estimate of the program-related solid waste generation rate. Locations of generation, disposal, and proposed growth within the ROI were determined and are identified in the impact analysis.

Changes in the generation rates were estimated by comparing the rates in the ROI with and without the program. Both direct and indirect generation rates were included. Rates were expressed in cubic yards (cy), and as a percent increase over the projected generation rates without the program. Total program-related wastes were evaluated in relation to the remaining capacity of the landfills. A change in capacity was measured as a reduction in the functional service life of the facility.

Energy Utilities. Direct energy utility impacts were derived by evaluating the use of electricity, natural gas, and liquid fuels in the peak-construction years and during the operations phase. The inventory of existing and planned facilities, distribution systems, and contract rates of supply provided information on the ability of the systems to meet baseline and program-induced demands.

Indirect energy utility impacts were estimated from population projections provided by the socioeconomic analysis (Section 4.1.2, Table 4.1.2-2). Per capita and energy utility customer use rates were multiplied by the projected population or housing units to obtain an estimate of the new energy demands. A factor of 0.6 kilowatt (kW) per person was used to estimate increased electricity demand and was based on historic usage data and consultations with local power companies. Location of facilities and distribution systems, and the contracted rates of supply within the ROI, were identified in the impact analysis, as well as existing conservation programs.

Changes in energy demands were estimated by comparing demand in the ROI with and without the program. Both direct and indirect demands were determined and are included. Electricity demand is expressed in megawatts (MW), natural gas use is expressed in thousand cubic feet (Mcf), and liquid fuels use is expressed in gallons. Any new capacity, transmission lines, pipelines, or contracts for supply established as part of the program were incorporated into the analysis. Program-related energy use was measured as a reduction in reserve margin or proven resources, or as a percent change to baseline demands. The ability to absorb increases in energy demands and to maintain dependable supply without power outages or service interruptions was an integral part of the impact analysis.

4.2.1.2 Determination of Levels of Impact

Impacts on utilities elements are directly related to increased service populations, population-induced land development, and to specific program-related construction and operations activities. For each of the four elements of the utilities analysis (potable water treatment and distribution, wastewater, solid waste, and energy utilities), program impacts were evaluated as either beneficial or adverse. The LOIs were formulated in terms of program-induced change in projected baseline utilities use for those elements where impacts were judged to be adverse. For energy utilities, LOIs were also established for each of the subelements (electricity, natural gas, and liquid fuels). A composite LOI was assigned to the energy utilities element after the relative merits of each subelement LOI was evaluated. The LOIs were defined generally for all utilities elements as the following:

- Negligible Impact -- Program-induced demands upon the utility system are absorbed by the existing system without any noticeable increase in demands or change in the quality of service; reliability of service is unaffected.

- Low Impact -- Program-induced demands create an increase in service requirements that consume a portion of system capacity; reliability of service is unaffected.

- Moderate Impact -- Program-induced demands create an increase in service requirements that approach the system capacity; temporary disruptions of service may occur.

- High Impact -- Program-induced demands exceed the capacity of the existing utility system; disruptions to the community and degraded service will occur.

4.2.1.3 Determination of Significance

The significance of utilities impacts were evaluated in accordance with Council on Environmental Quality (CEQ) regulations. Significance was assessed through evaluation of the context and intensity of the impacts. Context includes consideration of the settings (site, local, or regional) and the duration of the impacts. The CEQ regulations provide ten items that should be considered in evaluating intensity. Of these ten items, the following are applicable to the utilities resource:

- Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance, the effect will be beneficial.

- The degree to which the proposed action affects public health and safety.

- The degree to which the effects on the quality of the human environment are likely to be highly controversial.

- The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

- Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

- Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.

In addition to these considerations, which are specifically identified in the CEQ regulations, the following consideration are judged appropriate for the utilities resource:

- The degree to which the action may cause a change in the price of a resource or service, such as water use charges, sewer rates, solid waste collection rates, and electric cooperative energy charges.

On the basis of these intensity considerations and their contexts, impacts were rated as either significant or not significant.

4.2.1.4 Assumptions and Assumed Mitigations

As part of the environmental analysis of potential impacts on utilities systems from the program, several assumptions were made and include the following:

- Per capita water, wastewater, and solid waste generation rates would remain constant over the entire construction and operations phases.

- Current (1986) per capita energy consumption rates would remain constant during the construction and operations phases. This is a conservative assumption since national trends are toward a reduction of per capita energy use.

- Montana Power Company (MPC) would continue to supply the electrical needs for Malmstrom AFB. Installation of a 115-kilovolt (kV) transmission line and 30-MW substation onbase would be completed prior to the Small ICBM program demands.

- Electrical requirements at the launch facilities, with either pre-engineered buildings or earth-covered igloos, would be 100 kW per site. Requirements would be reduced to 55 kW per site if only one Hard Mobile Launcher (HML) per site is deployed.

- No natural gas would be used for construction activities at the base or in the deployment area.

- Adequate petroleum supply would be available at the regional and national level through the year 2000.

- Fuel consumption for passenger vehicles would follow the historical trend in Montana of 80 percent gasoline and 20 percent diesel fuel.

- Trucks used to haul cement, aggregate, concrete, steel, and metal for construction activities would travel one-way distances of 25 miles, and would make four trips per day. Truck fuel mileage will be 5 miles per gallon (MPG).

- Construction equipment and haul trucks would use diesel fuel, and would operate 260 days per year.

In analyzing utilities impacts, the following assumed mitigation measures were used:

- Local agencies would plan for and install facility expansions required currently or for baseline growth conditions;

- Energy planning would be coordinated with local and/or regional suppliers to ensure a timely and efficient energy supply;

- Air Force energy conservation design requirements would be incorporated into all new Air Force buildings; and

- The upgrading of substations, transformers, and transmission lines in the deployment area required to meet demands at the launch facilities would be accomplished as part of the proposed program.

4.2.2 Impacts of the Proposed Action

The proposed program would result in no short-duration demands to potable water, wastewater, and solid waste systems in Great Falls. Program-related demands would gradually increase beginning in 1990, with peak demands occurring in 1996 (Table 4.2.2-1), and then continuing through the operations phase at slightly reduced levels. These long-duration impacts are considered low and not significant because new demands can be met by existing facilities without any additional cost to the consumer or deterioration in their level of service. Short-duration impacts to potable water, wastewater, and solid waste systems in Lewistown and Conrad would occur since minor increases in demand would result from construction workers residing in these cities; however, they are expected to be negligible. No long-duration impacts are expected in these cities since demands would occur over 4 years. Short- and long-duration impacts to energy utilities are expected to be low and not significant. Short-duration impacts would occur as a result of increased demands for diesel fuel during the construction phase; these demands would be met from local supplies. Long-duration adverse impacts would occur as a result of increased energy demands; these demands would be met from existing facilities without any increased cost to the consumer or deterioration in the level of service. Long-duration beneficial impacts to energy utilities would occur as the Great Falls Gas Company recovers a portion of its sales. The discussion that follows addresses long-duration impacts, unless otherwise specified. Figure 4.2.2-1 summarizes the impacts to the utilities resource elements.

4.2.2.1 Potable Water Treatment and Distribution

Overall impacts to potable water treatment and distribution systems are considered to be of long duration and are expected to be low and not significant, regardless of the housing option selected.

City of Great Falls. Program-related potable water treatment requirements in Great Falls would peak in 1996, with an additional demand totaling 1.36 MGD. This requirement would increase city water demands, including onbase demands, from 12.41 MGD to 13.77 MGD or 11 percent. Maximum day demands in 1996 would reach approximately 43.1 MGD. Capacity of the treatment plant is 48 MGD and can provide adequate supplies to meet new demands. Programmed pump and filter replacements would continue to improve the reliability of the plant.

Program-related demands at Malmstrom AFB would increase from 1.3 MGD in 1990 to 2.48 MGD in 1996 or 91 percent. Demands throughout the operations phase would remain at 2.48 MGD. The City of Great Falls has the capacity to deliver 3.37 MGD to the base through the two existing pipelines (8 and 12-inch) at 70 pounds per square inch (psi). Maximum day use would increase from 3.25 MGD to 6.2 MGD in 1996. Onbase storage facilities are used to meet maximum day demands and have 2.8 MG available to supplement the supply from Great Falls. Yearly demands would reach 900 million gallons (MG) in 1996, which is approximately 97 percent higher than the current yearly contract of 460 MG. To accommodate this new demand the base would have to renegotiate their contract with the City of Great Falls. Based on the current contract, potable water requirements would increase payments to the city's water fund from $191,000 to $360,000.

Impacts to Great Falls potable water treatment facilities would be low and not significant since the new demands can be met by existing facilities without any additional cost or deterioration in the level of service.

Housing Option H1. Program-related potable water treatment requirements in the City of Great Falls would peak in 1996 with an additional demand totaling 1.39 MGD. This requirement would increase the city's water demands, including onbase demands, from 12.41 MGD to 13.8 MGD or 11.2 percent. Maximum day demands in 1996 are projected to reach 43.2 MGD. Demands associated with this option are 0.2 percent greater than the Proposed Action but would not alter the identified impacts. Capacity of the treatment plant is 48 MGD and can provide adequate supplies to meet new demands. Programmed pump and filter replacements would continue to improve the reliability of the plant.

Program-related demands at Malmstrom AFB would increase from 1.3 MGD in 1990 to 2.03 MGD in 1996 or by 56 percent. Great Falls has the capacity to deliver 3.37 MGD to the base through the two existing pipelines (8 and 12-inch) at 70 psi. In 1996, maximum day use would increase from 3.25 MGD to 5.08 MGD. Onbase storage facilities are used to meet maximum day demands and have 2.8 MG available to supplement the supply from Great Falls. Yearly demands would reach 740 MG in 1996, which is approximately 61 percent higher than the current yearly contract of 460 MG. To accommodate this new demand the base would have to renegotiate their contract with the city.

Impacts to Great Falls potable water treatment facilities would be low and not significant since the increased demand can be met by existing facilities without any additional cost or deterioration in the level of service.

Housing Option H2. Program-related potable water treatment requirements in Great Falls would peak in 1996 with an additional demand totaling 1.42 MGD. This requirement would increase city water demands, including onbase demands, from 12.41 MGD to 13.83 MGD or 11.5 percent. Maximum day demands in 1996 are projected to reach 43.3 MGD. Demands associated with Housing Option H2 are 0.5 percent greater than the Proposed Action with programmed housing but would not alter the identified impacts. Capacity of the treatment plant is 48 MGD which is adequate for the projected demands. Programmed pump and filter replacements would continue to improve the reliability of the plant.

Program-related demands at Malmstrom would increase from 1.3 MGD in 1990 to 1.59 MGD in 1996 or 22.6 percent. The City of Great Falls has the capacity to deliver 3.37 MGD to the base through the two existing pipelines (8 and 12-inch) at 70 psi. In 1996, maximum day use would increase from 3.25 MGD to 3.98 MGD. Onbase storage facilities are used to meet maximum day demands and have 2.8 MG available to supplement the

Table 4.2.2-1

Peak-Year Program-Induced Impacts on Utility Systems in the Region of Influence

		Proposed Action			Alternatives			Cumulative Impacts
	Baseline	Programmed Housing	Option H1	Option H2	Alternative 1	Alternative 2	Alternative 3	
Potable Water in MGD[1]								
Great Falls (1996)	12.41	1.36	1.39	1.42	0.99	1.62[2]	1.36	1.49
Percent Increase		11.0	11.2	11.5	8.0	13.0	11.0	12.0
Lewistown (1992)	1.85	0.02	0.02	0.02	0.03	0.04[3]	0.02	0.02
Percent Increase		1.3	1.3	1.3	1.4	1.9	1.3	1.3
Conrad (1993)	0.49	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Percent Increase		2.0	2.0	2.0	2.0	2.3	2.0	2.0
Wastewater in MGD								
Great Falls (1996)	9.7	0.93	0.96	0.99	0.68	1.11[2]	0.93	1.02
Percent Increase		9.6	9.9	10.2	7.0	11.4	9.6	10.5
Lewistown (1992)	2.5	0.01	0.01	0.01	0.01	0.02[3]	0.01	0.01
Percent Increase		0.5	0.5	0.5	0.5	0.7	0.5	0.5
Conrad (1993)	0.36	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Percent Increase		1.9	1.9	1.9	1.9	2.2	1.9	1.9
Solid Waste in cy								
Great Falls (1996)	235,400	14,441	17,306	20,113	10,653	17,361[2]	14,441	15,784
Reduction in Facility Service Life in Months		5	6	7	4	6	5	5.5
Lewistown (1992)	17,270	312	312	312	338	468[3]	312	312
Reduction in Facility Service Life in Months		<1	<1	<1	<1	<1	<1	<1
Conrad (1993)	25,600	105	105	105	105	120	105	105
Reduction in Facility Service Life in Months		<1	<1	<1	<1	<1	<1	<1

Table 4.2.2-1 Continued, Page 2 of 2

		Proposed Action			Alternatives			Cumulative Impacts
	Baseline	Programmed Housing	Option H1	Option H2	Alternative 1	Alternative 2	Alternative 3	
Energy								
Electricity in MW								
MPC (1996)	1,614	14.5	13.5	12.7	10.8	16.3	15.7	16.5
Percent Increase		0.9	0.8	0.8	0.7	1.0	1.0	1.0
Fergis Electric (1996)	22.5	3.1	3.1	3.1	3.1	3.9	3.4	3.1
Percent Increase		13.9	13.9	13.9	13.9	17.4	15.0	13.9
Marias River (1996)	31.1	0.4	0.4	0.4	0.4	0.5	0.4	0.4
Percent Increase		1.3	1.3	1.3	1.3	1.5	1.4	1.3
Sun River (1996)	28.4	1.9	1.9	1.9	1.9	1.9	2.1	1.9
Percent Increase		6.9	6.9	6.9	7.0	6.7	7.0	7.0
Natural Gas in MCF								
Great Falls Gas (1996)	5,872,000	278,875	278,875	278,875	211,025	314,525	278,875	300,725
Percent Increase		4.7	4.7	4.7	3.6	5.3	4.7	5.1
MPC (1996)	35,600,000	278,875	278,875	278,875	211,025	314,525	278,875	300,725
Percent Increase		0.8	0.8	0.8	0.6	0.8	0.8	0.8
Liquid Fuels in Gallons								
Gasoline (1996)	37,960,000	3,959,808	3,959,808	3,959,808	2,982,176	4,717,024[2]	4,359,808	4,279,840
Percent Increase		10.4	10.4	10.4	7.8	12.4	11.5	11.3
Diesel (1991)	4,440,000	1,131,330	1,131,330	1,131,330	946,842	1,230,986	1,131,330	1,131,330
Percent Increase		25.5	25.5	25.5	21.3	27.7	25.5	25.5

Notes: [1]Peak year is indicated in parentheses.
[2]Peak year is 1997 rather than 1996.
[3]Peak year is 1994 rather than 1992.

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible		
Low	○	●
Moderate	○	●
High	○	●
Beneficial Effects	(shaded)	

Note: Some resource elements may have both beneficial effects and adverse impacts.

UTILITIES

ELEMENT/AFFECTED INTEREST	PROGRAM IMPACTS (LOCAL) — SHORT DURATION: PROPOSED ACTION — PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	LONG DURATION: PROPOSED ACTION — PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
POTABLE WATER TREATMENT							○	○	○	○	○	○
GREAT FALLS							○	○	○	○	○	○
LEWISTOWN												
CONRAD												
WASTEWATER							○	○	○	○	○	○
GREAT FALLS							○	○	○	○	○	○
LEWISTOWN												
CONRAD												
SOLID WASTE							○	○	○	○	○	○
GREAT FALLS							○	○	○	○	○	○
LEWISTOWN												
CONRAD												
ENERGY UTILITIES	○	○	○	○	○	○	○	○	○	○	○	○
ELECTRICITY							○	○	○	○	○	○
MONTANA POWER COMPANY												
FERGUS ELECTRIC COOPERATIVE							○	○	○	○	○	○

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FIGURE 4.2.2-1 LOCAL IMPACTS TO UTILITIES ASSOCIATED WITH THE PROPOSED SMALL ICBM PROGRAM IN MONTANA

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible	□	
Low	∘	•
Moderate	○	●
High	◯	⬤
Beneficial Effects	░	

Note: Some resource elements may have both beneficial effects and adverse impacts.

UTILITIES

PROGRAM IMPACTS (LOCAL)

ELEMENT/AFFECTED INTEREST	SHORT DURATION						LONG DURATION					
	PROPOSED ACTION						PROPOSED ACTION					
	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
MARIAS RIVER COOPERATIVE												
SUN RIVER COOPERATIVE							∘	∘	∘	∘	∘	∘
NATURAL GAS AND HEATING							░	░	░	░	░	░
GREAT FALLS GAS COMPANY							░	░	░	░	░	░
MONTANA POWER COMPANY												
LIQUID FUELS	∘	∘	∘	∘	∘	∘						
GASOLINE												
DIESEL FUEL	∘	∘	∘	∘	∘	∘						

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FIGURE 4.2.2-1 CONTINUED

supply from Great Falls. Yearly demands would reach 580 MG in 1996, which is approximately 26 percent higher than the current yearly contract of 460 MG. To accommodate this new demand the base would have to renegotiate their contract with the city.

Impacts to Great Falls potable water treatment facilities would be low and not significant since the increased demand can be met by existing facilities without any additional cost or deterioration in the level of service.

City of Lewistown. Program-related potable water requirements for the Proposed Action would amount to an increase of 0.02 MGD or 1.3 percent in 1992 as a result of the inmigration of construction workers. Average day use would increase to 1.87 MGD with maximum day use increasing from 5.55 MGD to 5.6 MGD in 1992. Lewistown has the capacity to deliver 6.9 MGD from Big Springs through two pipelines (16 and 20-inch). This capacity is adequate to meet the increase in average day demands. Short-duration impacts to the potable water system would be negligible.

City of Conrad. Program-related potable water requirements for the Proposed Action would amount to an increase of 0.01 MGD or 2.0 percent in 1993 as a result of the inmigration of construction workers. Average day use would increase to 0.54 MGD with maximum day use increasing from 1.76 MGD to 1.8 MGD in 1993. Conrad has treatment capacity of 2.85 MGD and access to 3.4 MGD from Lake Frances through two 12-inch pipelines. This capacity is adequate to meet the increase in average day demands. Short-duration impacts to the potable water system would be negligible.

4.2.2.2 Wastewater

Regardless of the housing option selected, impacts to wastewater systems are expected to be of long duration, low, and not significant.

City of Great Falls. Program-related wastewater flows to the City of Great Falls treatment facility would peak in 1996. Average day flows would equal 0.93 MGD or 9.6 percent over the projected baseline of 9.7 MGD. Total treatment requirements, including onbase flows, would increase to 10.6 MGD or 50 percent of the existing capacity. Maximum day flows in 1996 are projected to reach 20.2 MGD. Treatment plant capacity is 21 MGD, which will be adequate to process flows through the year 2000.

Wastewater flows at Malmstrom AFB would increase from 0.75 MGD to 1.55 MGD by 1996 and continue at this level during the operations phase Program-related flows represent a 107-percent increase over the projected baseline. To collect the increased onbase flows, additional sewers would be constructed to service the new industrial facilities and about 1,750 housing units. In addition, a new lift station would be installed on the east side of the base to pump wastes from the expanded facilities located there. Capacity of the existing force main and pumping station that deliver sewerage to the city is 2.74 MGD. The pumping station would have to be upgraded to transmit the projected flows. The current contract with the City of Great Falls provides for the annual treatment of 300 MG at a cost of $150,000. As of 1996, annual flows would equal 565 MG and, based on the existing contract, revenues collected by the city would increase to $282,000.

Program-related wastewater flows would use a portion of the available capacity of the city's treatment plant; however, the flows would not affect the operation of the plant or require expansion of any of the systems at the treatment plant. Impacts would be low and not significant.

Housing Option H1. Program-related wastewater flows to the city's wastewater system would average 0.96 MGD in 1996 (the peak year). Program-related flows would represent a 9.9-percent increase over the projected baseline of 9.7 MGD. Total treatment requirements, including onbase flows, would increase to 10.65 MGD or 51 percent of the existing capacity. In 1996, maximum day flows would reach 20.2 MGD. Treatment plant capacity is currently 21 MGD and would be adequate to process flows through the year 2000.

Wastewater flows at Malmstrom AFB would increase from 0.75 MGD to 1.25 MGD by 1996 and would continue at this level during the operations phase. Program-related flows represent a 66-percent increase over the projected baseline. To collect the increased onbase flows, additional sewers would be constructed to service the new industrial facilities and about 870 housing units. In addition, a new lift station would be installed on the east side of the base to pump wastes from the expanded facilities located there. Capacity of the existing force main and pumping station that deliver sewerage to the city is currently 2.74 MGD. The pumping station would have to be upgraded to transmit the projected flows. The current contract with the City of Great Falls provides for the annual treatment of 300 MG at a cost of $150,000. As of 1996, annual flows, based on the existing contract, would equal 460 MG and revenues collected by the city would increase to $230,000.

Program-related wastewater flows would use a portion of the available capacity at the city's treatment plant; however, the flows would not affect the operation of the plant or require expansion of any of the systems at the treatment plant. Impacts would be low and not significant.

Housing Option H2. Program-related wastewater flows to the city's wastewater system would average 0.99 MGD in 1996 (the peak year). Program-related flows would represent a 10.2-percent increase over the projected baseline of 9.7 MGD. Total treatment requirements, including onbase flows, would increase to 10.69 MGD or 51 percent of the existing capacity. Maximum day flows in 1996 would reach approximately 20.3 MGD. Treatment plant capacity is 21 MGD, which will be adequate to process flows through the year 2000.

Wastewater flows at Malmstrom AFB would increase from 0.75 MGD to 0.96 MGD by 1996. Program-related flows represent a 28-percent increase over the projected baseline. To collect the increased onbase flows, additional sewers would be constructed to service the new industrial facilities. In addition, a new lift station would be installed on the east side of the base to pump wastes from the expanded facilities located there. Capacity of the existing force main and pumping station that deliver sewerage to the city is 2.74 MGD. These facilities would have adequate capacity to transmit the projected flows. The current contract with the City of Great Falls provides for the annual treatment of 300 MG at a cost of $150,000. As of 1996, annual flows would equal 315 MG, and based on the existing contract, revenues collected by the city would be $157,000.

Program-related wastewater flows would use a portion of the available capacity of the city's treatment plant; however, the flows would not affect the operation of the plant or require expansion of any of the systems at the treatment plant. Impacts would be low and not significant.

City of Lewistown. In 1992, the peak-construction year, wastewater treatment requirements in the City of Lewistown would increase by 0.01 MGD to 2.51 MGD as a result of program-related inmigration. Maximum day flows would increase from 3.25 MGD to 3.27 MGD. The city currently has the capacity to treat 2.83 MGD and has

treated flows exceeding 5 MGD for short periods of time. This capacity will be adequate to meet the increase in average day demands. Short-duration impacts to the wastewater system would be negligible.

City of Conrad. In 1993, the peak construction year, wastewater treatment requirements in the City of Conrad would increase by 0.01 MGD to 0.37 MGD as a result of the inmigration of program-related construction workers. Maximum day flows would increase to 0.65 MGD. Conrad has treatment capacity of 0.60 MGD. This capacity will be adequate to meet the increase in average day demands. Maximum day use could cause reductions in the 90-day retention time, but the effect on discharge quality should be minimal. Short-duration impacts to the wastewater system would be negligible.

4.2.2.3 Solid Waste

Regardless of the housing option selected, long-duration impacts to solid waste facilities are expected to be low and not significant.

City of Great Falls. Solid wastes generated in the City of Great Falls, the surrounding area, and at Malmstrom AFB are disposed at either the city's landfill or the landfill operated by Greens Disposal. Solid waste generation from all three locations would peak in 1996 at 14,441 cy (28 tons per day [T/day]) or a 6.1-percent increase over the baseline of 235,400 cy. A total of 111,345 cy of program-related wastes will be generated from 1990 to the year 2000. It is currently estimated that the Great Falls and Greens Disposal landfill sites have average lifespans of 14 years. Based on that estimate, program-related solid wastes would reduce the combined lifespan of these sites by 5 months. Both the city and Greens Disposal have adequate equipment to handle the slight overall increase in solid waste generation. Future landfill sites have been programmed by both operators that will provide capacity for a minimum of 15 years.

Hazardous materials generated in the ROI would not increase as a result of the program, regardless of the housing option. These wastes will continue to be shipped directly out-of-state unless Special Resources Management, Inc. is successful in establishing a transfer station in either Billings or Butte, Montana. Any hazardous wastes generated at the missile sites would be transported to the base for storage, handling, and disposal with the rest of the onbase hazardous materials.

Solid waste generation at Malmstrom AFB would peak in 1996 with an increase of 11,476 cy. This represents a 142-percent increase over the baseline generation rate of 8,080 cubic yards per year (cy/yr). An estimate of the wastes generated during the construction phase onbase was included in the analysis as direct program-induced solid wastes. From 1997 onward, annual solid waste disposal requirements would decrease slightly to 11,465 cy. Currently, the base contracts with Greens Disposal and a new contract bid is scheduled for 1989.

Hazardous wastes generated by the proposed program would not differ from those associated with the current Minuteman program. These wastes are generally sodium chromate, expended paints, solvents and thinners, oils, and other waste solids and liquids. A permitted 2,500-barrel hazardous waste storage facility would be constructed onbase as part of the proposed program to provide adequate space for the temporary storage of waste products. The Defense Reutilization and Marketing Office would continue to follow the base's Hazardous Waste Management Plan, which details the procedures for waste handling and disposal.

Because program-related solid waste disposal requirements would be handled by the city and Greens Disposal with minimal change in their operations, and since the reduction in the combined lifespans of the landfill sites is only 5 months out of 14 years, the impact would be low and not significant.

Housing Option H1. Solid waste generation from the entire area would peak in 1996 at 17,306 cy (33 T/day) or a 7.35-percent increase over the baseline of 235,400 cy. A total of 129,013 cy of program-related wastes would be generated from 1990 to the year 2000. It is currently estimated that the Great Falls and Greens Disposal landfill sites have average lifespans of 14 years. Based on that estimate, program-related solid wastes would reduce the combined lifespans of these sites by 6 months.

Both the city and Greens Disposal would have adequate equipment to handle the slight overall increase in solid waste generation. Future landfill sites have been programmed by both operators to provide capacity for a minimum of 15 additional years.

Solid waste generation at Malmstrom AFB would peak in 1996 with an increase of 6,554 cy. This represents an 81-percent increase over the baseline generation rate of 8,080 cy/yr. An estimate of the wastes generated during the construction phase onbase was included in the analysis as direct program-induced solid wastes. From 1997 onward, annual program-related solid waste disposal requirements would continue at 6,554 cy. Currently, the base contracts with Greens Disposal and competition for a new contract is scheduled for 1989.

Because program-related solid waste disposal requirements would be handled by the city and Greens Disposal with minimal change in their operations, and since the reduction in the combined lifespan of the landfill sites is only 6 months taken over 14 years, the long-duration impact would be low and not significant.

Housing Option H2. Solid waste generation for the entire area would peak in 1996 at 20,113 cy (39 T/day) or a 8.54-percent increase over the baseline of 235,400 cy. A total of 154,116 cy of program-related wastes would be generated from 1990 to the year 2000. It is currently estimated that the Great Falls and Greens Disposal landfill sites have average lifespans of 14 years. Based on that estimate, program-related solid wastes would reduce the combined lifespans of these sites by 7 months.

Both the city and Greens Disposal have adequate equipment to handle the slight overall increase in solid waste generation. Since Housing Option H2 has the greatest amount of new offbase housing, there may be the need for additional collection routes to service the new homes. Future landfill sites have been programmed by both operators to provide capacity for a minimum of 15 additional years.

Solid waste generation at Malmstrom AFB would peak in 1996 with an increase of 1,741 cy. This represents a 22-percent increase over the baseline demand of 8,080 cy/yr. An estimate of the onbase wastes generated during the construction phase was included in the analysis as direct program-induced solid wastes. From 1997 onward, annual program-related solid waste disposal requirements would continue at 1,741 cy. Currently, the base contracts with Greens Disposal and competition for a new contract is scheduled for 1989.

Because program-related solid waste disposal requirements would be handled by the city and Greens Disposal with minimal change in their operations, and since the reduction in the combined lifespans of the landfill sites is only 7 months out of 14 years, the long-duration impact would be low and not significant.

City of Lewistown. A total of 910 cy of additional solid waste would be generated from 1991 to 1995. In 1992, with a peak inmigration of 120 construction workers, 312 cy of waste would be generated; this is a 1.8-percent increase in solid waste disposal over the baseline of 17,300 cy. The disposal of the 910 cy would result in less than 1 month's change in service life of the two landfill facilities, operated by Seversons Disposal and Mister "M" Disposal, that serve the area. The existing collection systems are adequate to handle the new demands. Short-duration impacts would be negligible.

City of Conrad. A total of 240 cy of additional solid waste would be generated from 1991 to 1995. In 1993, with a peak inmigration of 70 construction workers, 105 cy of waste would be generated; this is a 0.4-percent increase in solid waste disposal for that year. This increase would result in less than 1 month's change in the service life of the city-owned landfill. The increase in solid waste generation would not have an adverse effect on the city collection and disposal system. Short-duration impacts would be negligible.

4.2.2.4 Energy Utilities

Regardless of the housing option selected, overall short- and long-duration impacts are expected to be low and not significant. Short-duration impacts would occur as result of increased demands for diesel fuel during the construction phase; these demands would be met from local supplies. Long-duration, adverse impacts would occur as a result of increased energy demands; these demands would be met from existing facilities without any increased cost to the consumer or deterioration in the level of service. Long-duration, beneficial impacts to energy utilities would occur as Great Falls Gas Company recovers a portion of its sales.

Electricity. Impacts to electrical systems have been evaluated for the MPC, which serves most of the ROI, Malmstrom AFB, and for the Fergus, Marias River, and Sun River rural electric cooperatives.

Montana Power Company. The electrical demands associated with the construction and operations phases in Great Falls, Lewistown, Conrad, Malmstrom AFB, and at selected launch facilities would affect the projected peak loads and reserve margins of the MPC. Increase in demand would reach a maximum of 14.5 MW by 1996 and would reduce the 10.5-percent projected reserve margin by 0.9 percent. The load forecasts of MPC include surplus, as well as plans to purchase electricity and upgrade some existing plants. A load increase of 14.5 MW would not affect the timing or need for major resource acquisitions and the reduced reserve margin would not affect the company's obligation to maintain a 9 to 13-percent reserve margin above peak demand. The impact would be negligible.

Malmstrom AFB increased demands are included in the program-induced demands to MPC. By 1990, the projected future baseline demand at Malmstrom AFB will be 11 MW. A planned 30-MW substation and 115-kV transmission line may be installed onbase prior to the proposed program replacing the use of the MPC northeast substation. The existing demand will use 35 percent of the new substation capacity. Following the construction phase, demand onbase would increase as a result of new support facilities and housing loads.

Demand would increase at the base by 1 MW in 1991. By 1996, when onbase construction is completed and new facilities are operational, total onbase demand would be 20 MW and would use 65 percent of the new substation capacity.

Housing Option H1. Demand would increase by 13.5 MW in 1996 and would reduce the 10.5-percent reserve margin to 9.7 percent. However, this 0.8-percent increase in demand and reduction in reserve margin would not affect service reliability and quality, or customer rates. A load increase of 13.5 MW would not create the need to purchase or plan for additional resources. The impact would be negligible.

Demand at Malmstrom AFB with Housing Option H1 would increase by 1 MW starting in 1991. Program-induced demand would increase to a total of 6.5 MW by 1993, increasing onbase demand to 17 MW. Total onbase demand would use approximately 55 percent of the new substation capacity.

Housing Option H2. Demand would increase by 12.7 MW and would reduce the 10.5-percent reserve margin to 9.7 percent. The MPC anticipates a small resource surplus through the year 2000. Planned resource acquisition and use of adequate reserve margins will supplement this surplus. The impact would be negligible.

Demand at Malmstrom AFB with Housing Option H2 would increase at onbase support facilities only. Housing Option H2 would result in a total onbase demand of 14.5 MW and would use 50 percent of the substation capacity.

Rural Electric Cooperatives. Electricity for construction at the launch facilities would be supplied by power from portable generators. The direct program-induced operational use of electricity at the launch facilities would be approximately 100 kW per site, which includes technical and nontechnical loads. This increased load would more than double the present load at the facilities. The existing transformer capacities are not sufficient to meet the new load, and will have to be upgraded along with associated system upgrades (e.g., conduits and wire sizes).

The capacities of the 50 substations serving the launch facilities range between 1 and 2 megavolt-amperes (MVA). Some of the substations will be adequate to handle the increased loads because of the excess capacity which is a result of overestimated load requirements for the Minuteman missiles. However, a portion of the substations would have to be upgraded to serve the increased demands at those launch facilities selected for proposed program deployment. In addition, the transmission lines at these substations would also have to be upgraded. This would be constructed as part of the proposed program. Testing would be conducted to determine which substations need upgrading to serve the increased demands and to ensure that no service interruptions occur to other connected loads (e.g., private homes) at these substations.

The Proposed Action would increase the peak demands of the rural electric cooperatives that serve the launch facilities. Assuming that the cooperatives supply the same percentage of launch facilities that they presently serve, the increased program-related demand would amount to 3,150 kW for Fergus Electric during the operations phase. This represents a 13.9-percent increase in the projected peak demand. The impact to Fergus Electric represents an increase in the projected average annual increase in peak demand, and would require an increase in the company's power requirements. Additional power may have to be acquired from Basin Electric Cooperative and MPC thermogeneration plants. Since this power is more expensive than the current supply from hydro facilities, the cost to Fergus Electric may increase with the use of this power to meet peak demands. Impacts would be low and not significant because program-related demands would not approach the capacity of the system and its interconnections with its suppliers.

For Marias River Electric, the increased load of 400 kW represents a 1.3-percent increase in the programed peak load. This increase is within the range of the programed annual increases in peak loads for the cooperative and would be considered a negligible impact.

For Sun River Electric, the increased load of 1950 kW represents a 6.9-percent increase in peak demand. The impact on the projected peak demand for Sun River Electric represents an increase above the projected 0.6-percent annual increase in peak load for the cooperative, and would require an increase in the company's power purchases. This may increase the price paid by Sun River because additional power supplies would be more costly than existing sources. Impacts would be low and not significant because program-related demands would not approach the capacity of the system and its interconnections with its suppliers.

Natural Gas and Heating. Impacts to natural gas systems have been evaluated for both the Great Falls Gas Company and the MPC.

Great Falls Gas Company. The Proposed Action would increase the total natural gas sales for the Great Falls Gas Company, regardless of the housing option chosen. Differences for the individual housing options would occur in relation to increased consumption in the city versus the increased consumption at Malmstrom AFB.

With the Proposed Action, the 500 new residential customers in the City of Great Falls would increase sales by 1 percent in 1996 and by 0.5 percent in 1999. Onbase use in the community center and housing units would increase use by a maximum of 80 percent in 1996 with the completion of the housing and other facilities.

Housing Option H1. Consumption in the City of Great Falls would increase sales by 2.7 percent in 1996 and by 2 percent in 1999. Onbase use would increase by a maximum of 42 percent by 1993 with the completion and subsequent use of new support facilities and housing units.

Housing Option H2. Consumption in the City of Great Falls would increase by 4.4 percent in 1996, and by 4 percent in 1999. Onbase use would increase by 7 percent in 1996 with the use of new support facilities.

Total sales for Great Falls Gas Company of 278,875 Mcf, regardless of the housing option, would represent a maximum increase of 4.7 percent in 1996, and would reduce slightly from 1997 onward. The company has a 30-percent excess capacity margin, and would easily supply the increased consumption. Presently, the infrastructure exists for Great Falls Gas Company to supply the increased demands at the base because of the recent decline in onbase natural gas use with the installation of the coal-fired central heat plant. This loss of sales to Malmstrom AFB represented 6 percent of the company's total sales. The program-induced consumption would recover some of this loss for the company; therefore, the impact would be beneficial.

Malmstrom Air Force Base. In 1986, a coal-fired, high-temperature water heat plant was installed onbase and replaced 50 percent of the natural gas-fired boilers. Onbase industrial and commercial-type facilities are heated from the coal-fired heating plant, while housing units and some other dispersed facilities continue to utilize natural gas. Peak load on the plant is estimated to be 163 million British thermal units per hour (MBtu/h) by 1990, with a reserve capacity of 95 percent. The Proposed Action, regardless of which housing option is chosen, would increase the peak load on the heat

plant to 233 MBtu/h by 1991. This would reduce the reserve capacity to 73 percent, and require additional capacity to ensure a minimum reserve capacity of 75 percent. By the end of 1995, the peak load would be 270 MBtu/h. With the addition of a fourth 85-MBtu/h boiler, the reserve capacity would be 94 percent, well above the assumed minimum reserve capacity of 75 percent. Additional coal consumption as a result of the new load is estimated to be 38,000 tons per year (T/yr).

Montana Power Company. The program-induced increase in natural gas sales for MPC represents increased sales to Great Falls Gas Company and increased sales in Lewistown and Conrad. For the Proposed Action, regardless of the housing option chosen, increased sales to MPC would reach a maximum of 0.8 percent in 1996 and 0.7 percent in the year 2000. The MPC retains a 25-year reserve of natural gas, which would adequately supply the increased demands in the ROI. Impacts to the MPC would be negligible.

Liquid Fuels. The direct program-related use of gasoline and diesel fuel would result from construction equipment use and support vehicle use during the operations phase. Indirect fuel requirements would result from personal vehicle use associated with the inmigrating population. Liquid fuel impacts have been evaluated for the City of Great Falls (including Malmstrom AFB), and for the cities of Lewistown and Conrad.

Direct fuel use attributable to the Proposed Action would begin in 1990 with the start of construction at Malmstrom AFB and in the deployment area. It is estimated that 40,000 gallons of diesel fuel would be used for construction equipment and haul trucks at the base and a similar amount in the deployment area, for a total of 80,000 gallons during 1990. At the peak of construction, approximately 1 MG per year of diesel fuel would be used for construction and haul vehicles at the base and in the deployment area.

Operations-related use of gasoline and diesel fuel would be required for the identified support vehicles. Beginning in 1996, it is estimated that the operations requirements would total 400,000 gallons of gasoline and 30,000 gallons of diesel fuel per year. Operations requirements for gasoline and diesel fuel use would be contracted by the Defense Fuel Supply Center for delivery to Malmstrom AFB. The contract for gasoline, which is renewed on an annual basis, would have to be increased to meet the new requirements associated with the Proposed Action. The present (1987) supplier of ground fuels, Conoco, would have the supply to meet the increased requirements, and delivery to the base would be by the existing tanker truck system, or through a combination of tanker truck and the Yellowstone Pipeline delivery system to the bulk petroleum products storage yard. An additional 40,000-gallon fuel storage capacity would be added to the base as part of the program in fiscal year (FY) 1992.

City of Great Falls. Indirect fuel requirements in the Great Falls Transportation Study Area (including Malmstrom AFB) would peak in 1996 with the inmigration of 8,120 personnel. The Proposed Action, regardless of the housing option chosen, would result in a 10.7-percent increase in the projected baseline use of gasoline in the area, and a 9.8-percent increase in baseline diesel fuel use. During the operations phase, program-induced use associated with the 7,580 inmigrants in Great Falls and at Malmstrom AFB would result in a 9.9-percent increase in projected baseline gasoline use and a 9.1-percent increase in baseline diesel fuel use.

City of Lewistown. The inmigrating population associated with construction in the deployment area would increase gasoline and diesel fuel consumption in the Lewistown area by 1.7 percent in 1992 (the peak year of inmigration). Local retailers would have adequate supply to meet the increased use.

City of Conrad. Inmigrating personnel associated with construction in the Conrad area would increase gasoline and diesel fuel consumption by 2 percent in 1993 (the peak year of inmigration). Local retailers would have adequate supply to meet the increased use.

For the Proposed Action, regardless of the housing option chosen, program-induced gasoline use in the peak-construction year represents a 10.4-percent increase in the projected baseline consumption in the ROI. During the operations phase, program-induced gasoline use would increase baseline use in the ROI by 9.7 percent. The impact is considered to be negligible because the baseline and program-related gasoline requirements would be supplied by local and regional refineries and the existing distribution network. In addition, the increased use represents a small portion of total gasoline use in Montana, and adequate production facilities and supplies are available to meet the new requirements.

For the Proposed Action, regardless of the housing option chosen, program-induced diesel fuel use in the peak-construction year represents a 25.5-percent increase in the projected baseline use in the ROI. During the operations phase, program-induced diesel fuel use would represent an 8.7-percent increase in the projected baseline use in the ROI. Diesel fuel use during the construction phase represents a measurable increase in local and regional use of diesel fuel. The production facilities and distribution network in the ROI would be adequate to meet the new diesel demands; therefore, the short-duration impact would be low and not significant. The long-duration impact would be negligible because the increase in diesel fuel use during the operations phase represents only a small increase in statewide diesel use, and would not affect the ability of local and regional suppliers to meet diesel demands.

4.2.3 Impacts of Alternatives

Impacts to utility systems for all three alternatives are rated the same as the Proposed Action, either negligible or low and not significant. Peak-year impacts to utility systems in the ROI are identified in Table 4.2.2-1 (Section 4.2.2).

4.2.3.1 Potable Water Treatment and Distribution

Alternative 1. The City of Great Falls potable water treatment system would experience a peak increase in average daily water use in 1996 of 0.99 MGD. Of the increase, 0.83 MGD are attributable to demands at Malmstrom AFB. The base's interconnections with the city's water system would be adequate to meet the forecasted demands; however, the existing contract would require renegotiation. Impacts are considered low and not significant since the total demand is well within the plant capacity of 48 MGD.

Program-related potable water requirements for the City of Lewistown would increase to a peak of 0.03 MGD or 1.4 percent in 1992. This increase is slightly greater than the Proposed Action. Short-duration impacts are considered negligible since Lewistown has adequate capacity to meet the increased demands.

Program-related potable water requirements for Alternative 1 in the City of Conrad would be the same as the Proposed Action. Short-duration impacts would remain negligible since Conrad has adequate capacity meet the increased demands.

Alternative 2. The City of Great Falls potable water treatment system would experience a peak increase in average daily water use in 1997 of 1.62 MGD. Of the increase, 1.36 MGD are attributable to demands at Malmstrom AFB. The base's interconnections

with the city's water system would be adequate to meet the forecasted demands; however, the existing contract would require renegotiation. Impacts are considered low and not significant since the total demand is well within the plant capacity of 48 MGD.

If no military family housing were built onbase, treated water requirements would increase about 15 percent above the water demand for the Proposed Action with Housing Option H2. This would increase water demand from 13.83 to 14.06 MGD for the City of Great Falls including Malmstrom AFB. This would not affect impact ratings because the demand would still be well within the plant capacity of 48 MGD.

Program-related potable water requirements for the City of Lewistown would increase to a peak of 0.04 MGD or 1.9 percent in 1994. Short-duration impacts are considered negligible since Lewistown has adequate capacity to meet the increased demands.

Program-related potable water requirements for the City of Conrad would increase to a peak of 0.01 MGD or 2.3 percent in 1993. Short-duration impacts would remain negligible since Conrad has adequate capacity meet the increased demands.

Alternative 3. Potable water treatment requirements are the same as those presented for the Proposed Action; consequently, the LOI and significance ratings do not change.

4.2.3.2 Wastewater

Alternative 1. Wastewater flows to the Great Falls treatment plant would increase by 0.68 MGD in the peak year 1996. This flow includes 0.57 MGD from program-related flows at Malmstrom AFB. The additional flows represent a 2.6-percent decrease from the Proposed Action. While program-related wastewater flows would use a portion of the available capacity of the city's treatment plant, they would not adversely affect the operation of the plant or require expansion of any of the systems at the plant. The existing contract between the city and Malmstrom AFB would have to be renegotiated. Impacts, therefore, would be low and not significant.

Wastewater flows in the City of Lewistown for Alternative 1 would increase by 0.01 MGD to 2.51 MGD in 1992. This 0.04-percent increase over the Proposed Action is associated with additional construction activity in the Lewistown area for this alternative. The city currently has the capacity to treat 2.83 MGD, which is adequate to meet the increase in demands. Short-duration impacts on the wastewater system are considered negligible.

Wastewater flows in the City of Conrad for Alternative 1 would increase by 0.01 MGD to 0.37 MGD in 1993. This is a 1.9-percent increase over the baseline flow of 0.36 and is equal to the Proposed Action. The city currently has the capacity to treat 0.6 MGD, which is adequate to meet the increase in demands. Short-duration impacts on the wastewater system are considered negligible.

Alternative 2. Wastewater flows to the Great Falls treatment plant would increase by 1.11 MGD in the peak year (1997). This flow includes 0.93 MGD from program-related flows at Malmstrom AFB. The additional flows represent a 1.8-percent increase from the Proposed Action. While program-related wastewater flows would use a portion of the available capacity of the city's treatment plant, they would not adversely affect the operation of the plant or require expansion of any of the systems at the plant. The existing contract between the city and Malmstrom AFB would have to be renegotiated. Long-duration impacts would be low and not significant.

If no military family housing were built onbase, wastewater flows would reach 10.85 MGD compared to 10.69 for the Proposed Action with Housing Option H2. This would not affect impact ratings.

Wastewater flows in the City of Lewistown for Alternative 2 would increase by 0.02 MGD in 1994, a 0.2-percent increase over the peak flows for the Proposed Action. Total average day flows would increase to 2.52 MGD or 0.7 percent. The city currently has the capacity to treat 2.83 MGD, which is adequate to meet the increase in demands. Short-duration impacts on the wastewater system would be negligible.

Wastewater flows in the City of Conrad for Alternative 2 would increase by 0.1 MGD in 1993, a 0.3-percent increase over the Proposed Action. The city currently has the capacity to treat 0.6 MGD, which is adequate to meet the increase in demands. Short-duration impacts on the wastewater system are considered negligible.

Alternative 3. Wastewater treatment requirements are the same as those presented for the Proposed Action; consequently, the LOI and significance ratings do not change.

4.2.3.3 Solid Waste

Alternative 1. Solid waste generation in the City of Great Falls, the surrounding area, and at Malmstrom AFB would peak in 1996 at 10,653 cy, a 1.6-percent increase over the Proposed Action. Solid waste generation at Malmstrom AFB would peak in 1996 with an increase of 8,026 cy. This represents a decrease of 42 percent from the Proposed Action. A total of 85,778 cy of program-related wastes would be generated in the Great Falls/Malmstrom AFB area between 1990 and the year 2000. This would reduce the combined lifespan of the two landfills by 4 months. As a result, the long-duration impact would be low and not significant.

Alternative 1 would increase solid waste generation by 338 cy or 2 percent in the City of Lewistown in 1992. A total of 936 cy of program-related solid wastes would be generated between 1991 and 1995. These amounts are slightly greater than the Proposed Action; however, the short-duration impact would remain negligible. Capacity of the landfills servicing Lewistown would be reduced by less than 1 month as a result of the disposal of program-related wastes from 1991 to 1995.

Alternative 1 would have the same impacts as the Proposed Action for the City of Conrad.

Alternative 2. Solid waste generation in the City of Great Falls, the surrounding area, and at Malmstrom AFB would peak in 1997 at 17,361 cy. This increase is slightly greater than the Proposed Action. At Malmstrom AFB, peak program-related solid waste generation would occur in 1996 with an increase of 13,140 cy. This is an 18-percent increase over the Proposed Action. A total of 129,027 cy of program-related wastes would be generated in the Great Falls/Malmstrom AFB area between 1990 and the year 2000. This would reduce the combined lifespan of the two landfills by 6 months. As a result, the long-duration impact would be low and not significant.

Alternative 2 would increase solid waste generation by 468 cy or 2.7 percent in the City of Lewistown in 1994. A total of 1,352 cy of additional wastes would be generated between 1991 and 1995. These amounts are slightly greater than the Proposed Action; however, the short-duration impact would remain negligible. Capacity of the landfills servicing Lewistown would be reduced by less than 1 month as a result of the disposal of program-related wastes from 1991 to 1995.

Alternative 2 would increase waste generation by 120 cy or 0.5 percent in the City of Conrad in 1993. A total of 315 cy of additional waste would be generated in Conrad between 1991 and 1995. These amounts are 0.1 percent greater than the Proposed Action; however, the short-duration impact would remain negligible. Capacity of the landfill servicing Conrad would be reduced by less than 1 month as a result of the disposal of program-related wastes from 1991 to 1995.

Alternative 3. Solid waste disposal requirements are the same as those presented for the Proposed Action; consequently, the LOI and significance ratings do not change.

4.2.3.4 Energy Utilities

Electricity.

Alternative 1. This alternative would increase demand on the MPC system by a maximum of 10.8 MW in 1996. This would reduce the projected reserve margin of 10.5 percent to 10.4 percent. This change is 0.2 percent less than the change associated with the Proposed Action. This would not affect resource planning, service reliability and quality, or customer rates. The impact would remain negligible.

Alternative 1 would increase the peak demands of the rural cooperatives serving the launch facilities. Peak demand for Fergus Electric would increase by 13.9 percent, the same increase associated with the Proposed Action. The increase would necessitate a change in the amount of power purchased by the cooperative and may affect the purchased price as well. The impact would be low and not significant. For Marias River Electric, peak demand would increase by 1.3 percent, a similar increase to the Proposed Action. The impact would remain negligible. Peak demand for Sun River Electric would be increased by 7 percent, and would require changes in the amount of power purchased by the cooperative and may increase the purchased price as well. This increase is the same as that for the Proposed Action; therefore, the impact would remain low and not significant.

Alternative 2. This alternative would increase demand on the MPC system by a maximum of 16.3 MW in 1996. This would reduce the projected 10.5-percent reserve margin by 0.9 percent. This change is 0.1 percent greater than the change associated with the Proposed Action. Resource planning would provide the necessary requirements to meet the demands. The reduction in the company's obligated reserve margin should not affect service reliability or quality. The impact would remain negligible.

Alternative 2 would increase Fergus Electric's projected peak load of 22.5 MW by 3,940 kW or 17.4 percent, as compared to a 13.9-percent increase with the Proposed Action. The cooperative has planned resource requirements based on a 1-percent average annual compound growth rate in peak demand. The program-induced increase would create the need for additional peak-load capacity, and would necessitate changes to the cooperatives purchased power requirements from Central Montana Electric. The purchase price may also be affected by the increased demand, but demands would not approach the capacity of the system and its interconnections with its suppliers. Therefore, the impact would be low and not significant.

Alternative 2 would increase Marias River Electric's projected peak demand of 31.1 MW by 500 kW or 1.5 percent, a 0.2-percent increase above the Proposed Action. There would be no change to the negligible impact rating. Alternative 2 would increase Sun River Electric's projected peak demand of 28.4 MW by 1,900 kW or 6.7 percent, which is

a 0.2-percent less than the Proposed Action. The company's projected resource requirements would have to be altered to account for the program-induced load. This would create changes in the quantity of power that they would purchase from Central Montana Electric, and may affect the price that Sun River pays for the power. The impact would be low and not significant.

Alternative 3. This alternative would reduce the MPC projected reserve margin of 10.5 percent by 1.0 percent, which is slightly greater than that associated with the Proposed Action. The impact would remain negligible. Alternative 3 would create increases to the peak demands of the rural cooperatives supplying the launch facilities. With the use of 200 launch facilities, loads at each facility with one HML are estimated to be 50 kW per HML and 5 kW for the crew shelter, for a total of 55 kW per launch facility.

Fergus Electric's peak demand of 22.5 MW would be increased by 3,465 kW or 15 percent as a result of this alternative. This change is 1.1 percent above the change associated with the Proposed Action. The increase in peak demand would necessitate changes to the cooperative's power requirements and purchases, and may affect the price paid by the cooperative, but demands would not approach the capacity of the system and its interconnections with its suppliers. The impact would be low and not significant. Marias River Electric's peak demand of 31.1 MW would increase by 440 kW or 1.4 percent as a result of Alternative 3, a 0.1-percent increase above the change associated with the Proposed Action. This would not affect the cooperative's power requirements and purchases, as they project an annual increase in peak demand of 2.6 percent. The impact would remain negligible. Sun River's peak demand of 28.4 MW would increase by 2,145 kW or 7.6 percent with this alternative, 0.7 percent above the change associated with the Proposed Action. This would necessitate changes to the cooperative's power purchases, and may affect the price paid for the power; therefore, the impact would be low and not significant.

Natural Gas and Heating.

Alternative 1. This alternative would increase total sales for Great Falls Gas Company by a maximum of 3.6 percent in 1996 and 3 percent in 1999. These increases are 1 percent less than those associated with the Proposed Action, and would result in a negligible impact. Alternative 1 would increase sales to MPC by a maximum of 0.6 percent in 1996 and by 0.5 percent in 1999. These increases are 0.2 percent less than those associated with the Proposed Action. The negligible impact rating would not change.

Alternative 1 would increase the peak load on the Malmstrom AFB central heat plant to 233 MBtu/h by 1991. By 1995, the peak load would be 270 MBtu/h. With the addition of a fourth 85-MBtu/h boiler, the reserve capacity would be 94 percent, well above the required reserve capacity of 75 percent.

Alternative 2. This alternative would increase total sales for Great Falls Gas Company by a maximum of 5.3 percent in 1996 and by 4.4 percent in 1999. These increases are similar to those for the Proposed Action, and would help the company to recover a majority of the lost sales to Malmstrom AFB. The impact is considered to be beneficial. Alternative 2 would increase sales to MPC by a maximum of 0.8 percent in 1996 and in 1999. These increases are similar to those associated with the Proposed Action and would not change the negligible impact rating.

Alternative 2 would increase the peak load on the Malmstrom AFB heating plant to 233 MBtu/h in 1991 and to 270 MBtu/h by 1995. With the addition of a fourth 85-MBtu/h boiler, reserve capacity would be 94 percent in 1995, well above the required 75-percent reserve capacity.

Alternative 3. This alternative would increase total sales for Great Falls Gas Company by a maximum of 4.7 percent in 1996 and by 4 percent in 1999. These increases are the same as those for the Proposed Action, and would help to recover a majority of the company's lost sales to Malmstrom AFB. The impact is considered to be beneficial. Alternative 3 would increase sales to MPC by a maximum of 0.8 percent in 1996 and by 0.7 percent in 1999. These increases are the same as those for the Proposed Action and the negligible impact rating would not change.

Liquid Fuels.

Alternative 1. The program-induced gasoline use in the peak-construction year would represent a 7.8-percent increase in the projected baseline use in the ROI in that year. During the operations phase, program-induced gasoline use would increase the projected use in the ROI by 7.3 percent. These increases are 2 percent less than the Proposed Action. The baseline and program-induced gasoline requirements would be supplied by local and regional refineries and the existing distribution network. The impact is considered negligible since there are adequate production facilities and supplies available in the ROI to meet the new gasoline use.

Program-induced diesel fuel use for Alternative 1 in the peak-construction year represents a 21.3-percent increase in the projected baseline use in the ROI. During the operations phase, program-induced diesel fuel use represents a 6.4-percent increase in the projected baseline use in the ROI. Diesel fuel use during the construction phase for this alternative would be 4 percent less than the Proposed Action; however, it represents a measurable increase in local and regional use of diesel fuel. The production facilities and distribution network in the ROI would be adequate to meet the new diesel fuel demands; therefore, the short-duration impact would be low and not significant. The long-duration impact is considered negligible because the increase in diesel fuel use during the operations phase is 2 percent less than the Proposed Action; however, it would not affect the ability of local and regional suppliers to meet the diesel demands.

Alternative 2. The program-induced gasoline use in the peak-construction year would represent a 12.4-percent increase in the projected baseline use in the ROI in that year. During the operations phase, program-induced gasoline use would increase the projected use in the ROI by 11.8 percent. These increases are 2 percent greater than the Proposed Action; however, the baseline and program-induced gasoline requirements would continue to be supplied by local and regional refineries and the existing distribution network. The impact is considered negligible since there are adequate production facilities and supplies available in the ROI to meet the new gasoline use.

Program-induced diesel fuel use for Alternative 2 in the peak-construction year would represent a 27.7-percent increase in the projected baseline use in the ROI. During the operations phase, program-induced diesel fuel use would represent a 11.1-percent increase in the projected baseline use in the ROI. Diesel fuel use during the construction phase for this alternative is 3 percent greater than the Proposed Action and represents a measurable increase in local and regional use of diesel fuel. The production facilities and distribution network in the ROI would be able to meet the new diesel demands; therefore, the short-duration impact would be low and not significant. The increase in diesel fuel

use during the operations phase is 2 percent greater than the Proposed Action; however, it would not affect the ability of local and regional suppliers to meet the diesel demands. Therefore, the long-duration impact is considered negligible.

Alternative 3. The program-induced gasoline use in the peak-construction year would represent a 11.5-percent increase in the projected baseline use in the ROI in that year. During the operations phase, program-induced gasoline use would increase the projected use in the ROI by 10.9 percent. These increases are 1 percent greater than the Proposed Action due to increased use during the operations phase. The baseline and program-induced gasoline requirements would continue to be supplied by local and regional refineries and the existing distribution network. There are adequate production facilities and supplies available in the ROI to meet the new gasoline use; therefore, the impact is considered negligible.

Program-induced diesel fuel use for Alternative 3 in the peak-construction year would represent a 25.5-percent increase in the projected baseline use in the ROI. During the operations phase, program-induced diesel fuel use would represent a 9.3-percent increase in the projected baseline use in the ROI. Diesel fuel use during the construction phase is similar to the Proposed Action and represents a measurable increase in local and regional use of diesel fuel. The production facilities and distribution network in the ROI would be able to meet the new diesel demands; therefore, the short-duration impact would be low and not significant. The increase in diesel fuel use during the operations phase is slightly higher than the Proposed Action; however, the increase would not affect the ability of local and regional suppliers to meet the diesel demands. Therefore, the long-duration impact is considered negligible.

4.2.4 Cumulative Impacts

In addition to the development of the Small ICBM program, Malmstrom AFB is a potential location for the Peacekeeper in Rail Garrison program. The Peacekeeper program would add an additional 317 personnel at the base and require new construction amounting to approximately 285,000 square feet. These additions would commence in 1991 and be completed by 1993. The effects of this program in conjunction with the Proposed Action on the utilities resources of the City of Great Falls and Malmstrom AFB are discussed in the following sections.

4.2.4.1 Potable Water Treatment and Distribution

Impacts to the City of Great Falls potable water treatment system would peak in 1996 as water use increases by 1.49 MGD or 12 percent. Of the increase, 1.28 MGD would be attributable to demands at Malmstrom AFB. Demands associated with Peacekeeper in Rail Garrison basing would increase average day demands by approximately 0.8 percent over the Proposed Action. Total average day use for the entire system would reach 13.9 MGD.

Impacts would be low and not significant since the capacity of the Great Falls treatment facility would be adequate for the projected demands. In addition, the base's interconnections with the city's water system can supply 3.37 MGD, which would be adequate to meet average day demands. The base's contract with the city allows for the annual use of 460 MG. During the operations phase, annual use would increase to 940 MG requiring renegotiation of the existing contract.

The potable water systems of Lewistown and Conrad would not be affected as a result of the Peacekeeper in Rail Garrison program.

4.2.4.2 Wastewater

Wastewater flows to the Great Falls treatment plant would increase by 1.02 MGD to a peak of 10.71 MGD by 1996. The additional flows represent a 0.9-percent increase over the Proposed Action. Wastewater flows at Malmstrom AFB would increase by 0.86 MGD in 1996 and continue at this level during the operations phase. Capacity of the existing pump station and force main that deliver sewerage to the city is 2.74 MGD and the treatment plant capacity equals 21 MGD. These facilities have adequate capacity to transmit and process the projected flows. The current contract with the City of Great Falls provides for the annual treatment of 300 MG at a cost of $150,000. As of 1996, annual flows would equal 590 MG and costs, based on the existing contract, would increase to $295,000.

Impacts would be low and not significant since program-related wastewater flows would use a portion of the available capacity of the city's treatment plant and would not adversely affect the operation of the plant or require expansion of any of the systems at the plant. The existing contract between the city and Malmstrom AFB would have to be renegotiated.

The wastewater systems of Lewistown and Conrad would not be affected as a result of the Peacekeeper in Rail Garrison program.

4.2.4.3 Solid Waste

The cumulative effects on solid waste generation in Great Falls, the surrounding area, and at Malmstrom AFB would peak in 1996 with an additional 15,784 cy. This increase is 0.6 percent greater than the Proposed Action. Program-related onbase waste generation would peak in 1996, and 12,428 cy of additional wastes would be generated. This is a 12-percent increase over the Proposed Action. Total program-related solid wastes generated in the Great Falls/Malmstrom AFB area between 1990 and the year 2000 would be 122,319 cy. This would reduce the remaining service life of the two landfills by 5.5 months.

Solid waste generation at Lewistown and Conrad would not be affected by the Peacekeeper in Rail Garrison program.

4.2.4.4 Energy Utilities

Electricity. The Small ICBM and Peacekeeper programs would cumulatively increase demand on MPC by a maximum of 16.5 MW in 1996. This would reduce the projected 10.5-percent reserve margin by 1 percent. This change is similar to the Proposed Action and the impact would remain negligible.

The cumulative effects of the Peacekeeper in Rail Garrison and Small ICBM programs would increase the projected peak load of Fergus Electric by 13.9 percent, the same as that for the Proposed Action. This increase would necessitate changes in the amount of power purchased by the cooperative, and may have the effect of increasing the price paid for power by the cooperative. The impact would be low and not significant. The cumulative effects of the two programs on the peak demand for Marias River would be similar to that of the Proposed Action. Because the 1.3-percent increase would not

create the need for additional power purchases, the impact would be negligible. For Sun River Electric, the cumulative effects of the two programs would increase peak demand by 7 percent, the same as that for the Proposed Action. Because this would necessitate changes in the amount of power purchased by the cooperative, and may also affect the price paid for power by Sun River, the impact would be low and not significant.

Natural Gas. The cumulative effects would result in an increase in sales for Great Falls Gas Company of a maximum of 5.1 percent in 1996, and 4 percent in 1999 similar to the Proposed Action. This would help to recover a majority of the reduced sales to Malmstrom AFB as a result of the installation of the onbase central-heating plant. The impact to Great Falls Gas Company would be beneficial. The increase in total sales of 300,725 Mcf for MPC would be slightly greater than the Proposed Action and would amount to a maximum of 0.8 percent in 1996 and in 1999. The impact would remain negligible. The cumulative effects on the heating load at Malmstrom AFB would amount to a peak load of 239 MBtu/h by 1991, reducing the reserve capacity to 71 percent. By the end of 1995, peak load would be 275 MBtu/h. These increases in peak load are slightly higher than the Proposed Action. With the installation of an additional 85-MBtu/h boiler in 1991, there would be sufficient reserve capacity to meet any peak loading requirements.

Liquid Fuels. The cumulative effects of the Peacekeeper in Rail Garrison and Small ICBM programs would result in a 11.3-percent increase over projected baseline gasoline use in the ROI in the peak-construction year. During the operations phase, program-induced gasoline use would increase the projected use in the ROI by 10.7 percent. The baseline and program-induced gasoline requirements would be supplied by local and regional refineries and the existing distribution network. There are adequate production facilities and supplies available in the ROI to meet the new gasoline use; therefore, the impact is considered negligible.

Cumulative effects of the Peacekeeper in Rail Garrison and Small ICBM programs during the construction phase would represent a 25.5-percent increase in the projected baseline diesel fuel use in the ROI. During the operations phase, program-induced diesel fuel use would represent a 9.5-percent increase in the projected baseline use in the ROI. The impact on diesel fuel use during the construction phase is the same as the Proposed Action and represents a measurable increase in local and regional use of diesel fuel. The production facilities and distribution network in the ROI would be able to meet the new diesel fuel demands; therefore, the short-duration impact would be low and not significant. The increase in diesel fuel use during the operations phase is slightly higher than the Proposed Action; however, it would not affect the ability of local and regional suppliers to meet the diesel fuel demands; therefore, the long-duration impact is considered negligible.

4.2.5 Impacts of the No Action Alternative

Under the No Actions Alternative, activities associated with maintenance of the current Minuteman program will continue indefinitely at Malmstrom AFB. The baseline forecast described in Section 3.2 represents the implications of the No Action Alternative.

4.2.6 Potential Mitigation Measures

No mitigation measures are recommended for utilities beyond those assumed in Section 4.2.1.4.

4.2.7 Irreversible and Irretrievable Resource Commitments

Direct program energy requirements for the construction and operations phases represent the only irreversible and irretrievable commitment of energy resources required for the program.

4.2.8 Relationship Between the Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The quantities of energy required for proposed program construction and operations phases are small in a local and regional context. The use of these resources now will not materially affect their availability for future use. No energy development or use options are foreclosed by the proposed program.

4.3 Transportation

The deployment of the proposed Small Intercontinental Ballistic Missile (ICBM) has the potential to increase congestion and delay on transportation systems. As a result, the impact analysis process for transportation included consideration for roads, public transportation, railroads, and commercial airports. Emphasis is on impacts to the road/highway system, which is the transportation facility most likely to be affected, particularly during the construction phase.

4.3.1 Impact Analysis Methodology

The impact analysis methodology for transportation involved three separate procedures: evaluation of program impacts, determination of levels of impact (LOI), and determination of the significance of impacts. The methodology also included consideration of a number of assumptions and assumed mitigations. Impacts were evaluated at the local level and an overall collective assessment was made for each resource element. For roads, local-level impacts were evaluated for principal arterial streets in Great Falls, Lewistown, and Conrad, and on primary, secondary, and county roads in the deployment area. For public transportation, local-level impacts were evaluated for the City of Great Falls. For railroads and airports, impacts were evaluated at the local level for Great Falls, Lewistown, and Conrad.

4.3.1.1 Evaluation of Program Impacts

Roads. The analysis of the effects of the proposed program on roads is centered on the potential impacts of direct and indirect employment commuting. Proposed program impacts on roads were examined in terms of peak-hour commuting levels of service (LOS) (Section 3.3.2.2, Table 3.3.2-1). The analysis involved an estimation of the number of workers and inmigrants that will use specific lengths of roads/highways, conversion of these program-induced commuters to peak-hour traffic volumes, and estimation of the resultant with-program LOS.

Program manpower estimates and their classes of activity (construction, assembly and checkout [A&CO], operation, etc.) were obtained from the proposed program description. Both direct and indirect transportation impacts were addressed in this study. Direct transportation impacts were derived from program-induced traffic such as commuting by construction and operations personnel, construction traffic, and Hard Mobile Launcher (HML) maintenance movements. Indirect transportation impacts were induced by traffic generated by worker dependents, service and utilities operations, indirect employment, and by any traffic generated by increased use of recreational facilities in the region.

Program-related travel patterns were evaluated on the basis of proposed program work locations, work schedules, and vehicle occupancies. A detailed phasing schedule for launch facility modifications and road improvements will be developed as part of the siting process. For purposes of this environmental analysis, a general phasing schedule has been assumed. Road and launch facility construction closest to the base will be accomplished first and then gradually move farther from the base. The most direct routes from population centers to the worksites were then determined, and the corresponding program-induced traffic was assigned to the road/highway system. Commuters were then converted to trips through application of ridership factors. For this analysis, all workers were assumed to commute by passenger car, with a ridership of 1.1 passenger per vehicle for up to 10 miles, 1.35 passengers per vehicle for distances

between 10 and 15 miles, and 1.55 per vehicle for longer distances. These are derived from information in the National Cooperative Highway Research Program (NCHRP) Report 187 Quick Response Urban Travel Estimating Techniques and Transferable Parameters (Transportation Research Board 1978) and are found to be reasonable values for these distance ranges.

Travel patterns by inmigrants within population centers, particularly within Great Falls, were estimated by using the procedures for traffic assignment described in the NCHRP Report 187 to the program years. The number of additional vehicle trips made by inmigrants was combined with baseline traffic projections to determine impacts to the urban road system. Traffic assignments were made only on principal arterials within the urban limits. These principal arterials were identified by the Federal Aid Urban system. The resulting then-year LOS was subsequently calculated and compared with the without-program conditions. The LOS determined using the procedures given in the Highway Capacity Manual (Transportation Research Board 1985) for arterial streets does not only provide the basis for evaluating the degree of congestion on the road in terms of increase in number of vehicles including heavy commercial vehicles, but also evaluates the effects of increased queue and delays, and reduction in safety levels.

Public Transportation. The analysis of the effects of the proposed program on public transportation was centered on the ability of the public transit system to service the demands of the added population. Program-related public transit demand was estimated based on the projected population and housing demands identified by the socioeconomics resource. These were then added to future without-program conditions, and the resulting total transit demand was then compared to future or planned capacity without the program.

Railroads. The analysis of the effects of the proposed program on railroads was centered on the potential change in rail transport demand brought about by specific program requirements, particularly the movement of heavy construction and operations equipment and materials. Program-related rail demands were obtained from the proposed program description and were then compared to the corresponding future baseline capacity of the railroads.

Airports. The analysis of the effects of the proposed program on airports is centered on the potential change in air transport demand and its effect on airport facilities. Program-related air passenger traffic and freight demands were added to future without-program conditions. The total traffic resulting from the program was then compared to future or planned capacity without the program.

4.3.1.2 Determination of Levels of Impacts

The effect of program-induced traffic on the quality of transportation service will vary at different levels of intensity. The measure of quality or LOI is taken to vary in relation to the ratio of the rate of flow to the capacity of the transportation facility. The LOIs are defined below for each of the transportation elements.

Roads. For roads, the change in the intensity of the quality of service is measured by changes in the traffic LOS. The LOI assignments are related to the changes in motorist safety and satisfaction associated with changes in LOS rating or with appreciable increases in volume at degraded service levels. For example, a change from LOS A to B results in comparatively little inconvenience, delay, or hazard. By contrast, a change from LOS E to F results in breakdown conditions: the level of annoyance is high, delays

are severe, and the potential for collisions is sharply increased. An appreciable impact may be produced even without a change in LOS rating if the roadway section is already at a degraded LOS rating (LOS D, E, or F) and additional traffic will result in annoyance, slowing, and increased hazard. An increase in the amount of heavy vehicles in the traffic stream could also change the LOS rating. These conditions are reflected in the LOI assignments and were also adopted in the Legislative Environmental Impact Statement (LEIS). Impacts are considered negligible if the volume of traffic attributable to the proposed program is not appreciable (i.e., is less than what would occur in 2 years of normal growth), regardless of the occurrence of a calculated change in LOS. The operational conditions along a freeway, multilane road, two-lane highway or an urban arterial street under each LOS letter scores are described in Table 3.3.2-1 (Section 3.3).

The measurement of the changes in quality of service at arterial sections is also expressed in terms of changes in the arterial LOS. The same LOI assignments using LOS changes were applied for measuring effects of increased queue lengths, delays, and service operations at arterial streets.

The LOIs reflecting these considerations are characterized as follows:

- Negligible Impact -- No change would occur in LOS for categories A, B, or C, even with addition of appreciable volumes of traffic. (Does not apply at LOS D, E, or F). Although traffic volumes may increase, the motorist would perceive no essential difference in traffic operations.

- Low Impact -- The LOS would decline from A to B or B to C, or appreciable volume is added at LOS D. The motorist might perceive a slight change in traffic operations.

- Moderate Impact -- The LOS would decline from A to C, C to D, or D to E, or appreciable volume is added at LOS E. The motorist would perceive a noticeable decrease in the quality of service of traffic operations.

- High Impact -- The LOS would decline from A to D, A to E, A to F, B to D, B to E, B to F, C to E, C to F, D to F, or E to F, or appreciable volume is added at LOS F. The motorist would perceive a decided decrease in service quality of traffic operations, or existing LOS F conditions would be extended in duration and/or worsened.

Public Transportation. For local passenger bus transit, the quality of service is measured by scheduling, passenger comfort, and ease of travel. For taxis, the quality of service is measured by response, travel time, and size of fleet. Comfort is largely determined by the degree of crowding in the bus, or the number of passengers who are forced to stand rather than sit. At some stage, capacity can be exceeded and additional buses or taxis should be placed in service. Additional buses could offer a higher level of passenger comfort, but along with additional taxis, might have a slight adverse effect on overall traffic flow. The LOIs for public transportation are as follows:

- Negligible Impact -- Change in projected baseline that would cause an increase in the number of passengers but would require no bus schedule modifications or no increase in taxi response time or travel time.

- Low Impact -- Change in projected baseline that would require modifications to bus schedules but all passengers would be seated, or that would cause an increase in taxi response and travel times. No additional buses or taxis would be required.

- Moderate Impact -- Change in projected baseline that would require bus schedule changes with standees at peak hours, or that would cause increases in taxi response and travel times and additional taxis may be added to the fleet.

- High Impact -- Change in projected baseline wherein buses would be at full capacity, or increases in taxi response time would be beyond reasonable customer acceptable levels. Additional buses and taxis would be required.

Railroads. For railroads, the LOIs were measured by changes in the various aspects of rail operations, such as frequency of service, number and capacity of trains, holding facilities and rail yards, and system of operations. The LOIs for railroads are as follows:

- Negligible Impact -- Change in projected baseline that would result in no change in current schedules or no increase in regular services, such as freight handling, are needed.

- Low Impact -- Change in projected baseline that would require schedule changes with no additional manpower needed to handle additional freight. No additional physical facilities would be required.

- Moderate Impact -- Change in projected baseline that would require additional manpower and modifications to schedules and system of operations to handle additional freight. No additional physical facilities would be required.

- High Impact -- Change in projected baseline that would require additional manpower and the use of all present capacity of holding facilities, rail yards, and other physical facilities to handle additional freight. Enlargement or relocating of facilities would be necessary.

Airports. For airports, the LOIs were measured by changes in air operations, safety, and landside facilities, such as terminal building and aircraft and vehicular parking facilities. The LOIs for airports are as follows:

- Negligible Impact -- Change in projected baseline that would require no increases in airport operations or terminal facilities.

- Low Impact -- Change in projected baseline that would require changes in schedules but no additional manpower or terminal facilities would be required to handle additional passengers and freight.

- Moderate Impact -- Change in projected baseline that would require additional manpower and modifications to schedules and systems of operations with no additional terminal facilities required.

- High Impact -- Change in projected baseline that would approach airport capacity, requiring changes in projected baseline operation procedures and expansion of terminal facilities at the present airport site.

4.3.1.3 Determination of Significance

The significance of transportation impacts were evaluated in accordance with Council on Environmental Quality (CEQ) regulations. Significance was assessed through evaluation of the context and intensity of the impacts. Context includes consideration of the settings (site, local, or regional) and the duration of the impacts. The CEQ regulations provide ten items that should be considered in evaluating intensity. Of these ten items, the following are applicable to the transportation resource:

- Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

- The degree to which the proposed action affects public health or safety.

In addition to these considerations, which are specifically identified in the CEQ regulations, the following consideration is judged appropriate for the transportation resource:

- The degree to which the LOS would be reduced below minimum desirable design standards requiring facility improvements with related capital expenditures.

On the basis of these considerations, the following criteria have been developed for evaluating the significance of impacts to each resource element.

Roads. An impact was considered significant if the LOS is affected at or reduced to LOS D or lower for more than 1 hour per day due to program-related traffic. The 1-hour criterion reflects a daily duration of impact beyond the usually accepted standard for road design and analysis. The LOS criterion reflects motorists' exposure to conditions below minimum desirable design standards. Both factors imply associated impacts on safety, and potential demands for facility improvements with related capital expenditures.

Public Transportation. An impact was considered significant if it could result in an increase in the number of passengers over a continuous extended period of time which would require additional vehicles or modifications in schedule and service.

Railroads. An impact was considered significant if it could result in increased railroad traffic for a continuous extended period of time which would require modification to facilities or could begin to affect train traffic beyond the program area.

Airports. An impact was considered significant if it could result in increased operations over a continuous extended period of time which would require modifications to the system of operations and terminal facilities.

4.3.1.4 Assumptions and Assumed Mitigations

During the construction phase, most of the traffic would center around the major cities of Great Falls, Lewistown, and Conrad, and the corresponding construction sites at the base and the deployment area. This would include the movement of construction equipment, deliveries of materials and supplies, and commuting by construction workers, their dependents, and other inmigrants. Based on the construction scenario described in

the proposed program descriptions, a general phasing schedule was developed to better assign traffic on the roads/highways. Depending on the areas where construction is to occur, workers were assumed to commute from the nearest population centers of either Great Falls, Lewistown, or Conrad. Construction workers at the base are expected to reside within Great Falls. The assignment of construction workers and the movement of construction equipment, materials, and supplies were then developed based on this construction program. Of the total number of construction workers, 70 percent are expected to be filled by local hires, 7 percent by weekly commuters from elsewhere in the State of Montana, and 23 percent by relocating workers either from outside or within the state.

In addition to construction of program facilities, portions of the public road system currently used and designated as Minuteman transporter/erector (T/E) routes connecting Malmstrom Air Force Base (AFB) to the launch facilities would be improved. Some launch facility access roads would be modified by widening and increasing the turning radius of the intersection to accommodate the HML. A certification process involving the Federal Highway Administration, state and local transportation agencies, Military Traffic Management Command, and the Air Force would determine specific road improvements, location, and resources. In the interim, estimates have been made regarding anticipated changes required to accommodate the Small ICBM mission on existing T/E routes. Proposed improvements may include upgrading of two-lane paved and gravel roads, widening of intersections and some cattle guards, the replacement or extension of drainage culverts, and the reconstruction of bridges evaluated as incapable of accommodating the HML. Roads and bridge upgrades are assumed to occur on roads leading to the launch facilities which are to be constructed during the year.

Normal construction procedures and practices would be exercised. Interruptions to daily traffic at bridge construction sites would be minimized through the use of detours or alternating direction of traffic by leaving a single lane open. Alternate routes would be used where available. In some instances, temporary detour roads with temporary bridges would be constructed near the bridge construction sites to accommodate daily traffic during bridge replacement. Road and bridge construction would require some temporary construction disturbances along the public right-of-way for the storage of construction equipment and material stockpiles. These areas may also include small onsite construction offices. Aggregate sources were identified within 30 miles of each construction site and the shortest routes taken by trucks hauling aggregate were selected for analysis.

Assembly and installation of the missile and the reentry vehicle into the HML would occur at Malmstrom AFB. The operational HML would then be moved by special equipment to the launch facility under constant surveillance that would include security and safety escort forces providing traffic and public interface control. The A&CO of the HML shelter at the launch facility would be supported from the base. Materials and personnel would be shuttled to and from the launch facility with commercially available transport vehicles.

During normal operations, each HML would remain stationary and would not move except for maintenance at Malmstrom AFB, which is anticipated once per year per HML. Vehicle types and trip frequencies expected to occur during the operations phase are shown in Table 1.3.2-1 (Section 1.3.2).

Operations personnel are assumed to reside at Malmstrom AFB or within the Great Falls area. All Site Activation Task Force (SATAF) and A&CO personnel are assumed to reside offbase within the Great Falls area. The Great Falls Transportation Study area

was used to distribute housing requirements within the Great Falls area. Traffic commuting to the base was then assigned on principal arterial streets based on probable places of residence determined by the land use and socioeconomics housing study.

No specific mitigation measures have been assumed as part of the transportation impact analysis.

4.3.2 Impacts of the Proposed Action

Overall long-duration impacts to roads would range from low to high depending on the housing option selected (Figure 4.3.2-1). These impacts would be significant for Housing Options H1 and H2, but would not be significant for the Proposed Action with programmed housing. Short-duration impacts would be high and significant for all housing options. Long-duration impacts would also be beneficial as the result of road and bridge improvements. All impacts to public transportation, railroads, and airports are rated negligible.

4.3.2.1 Roads

Overall short-duration impacts on roads would be high and significant for all housing options due to increased congestion and delay including the further aggravation of service along roads already providing degraded levels. Long-duration impacts on roads for Housing Options H1 and H2 would remain high and significant because of additional commuting to the base by operations personnel residing offbase. Long-duration impacts on roads for the Proposed Action with programmed housing are considered low and not significant because projected baseline traffic volumes on deployment area roads are low and the LOS would not be reduced below minimum desirable standards. Long-duration impacts would also be beneficial as a result of road and bridge improvements. Long-duration impacts on roads in Great Falls for the Proposed Action with programmed housing are considered negligible because only a few operations personnel will reside in the community. Both short- and long-duration impacts on roads in Lewistown and Conrad are judged to be negligible.

The employment opportunities generated by the construction and operations of the Small ICBM would result in a sizable influx of people into the area and a corresponding increase in traffic. This growth in traffic would develop more particularly within Great Falls where most of the additional population is expected to reside. Adverse impacts would occur when the growth in traffic causes delay and inconvenience to motorists or where road improvements are needed to accommodate the anticipated traffic.

Under the Proposed Action, onbase construction would start in 1990 with 785 workers making an estimated 715 passenger-car equivalent trips to the base during the peak hour. Construction activity would continue up to 1993 with the construction of both technical and personnel support facilities. Total direct construction employment is estimated to generate additional passenger-car equivalent trips of 480, 800, and 680 in 1991 through 1993. Onbase construction activities are expected to be completed by 1994. In addition, operations personnel at the base are expected to generate about 10 passenger-car trips starting in 1991, increasing to 265 trips in 1996 and thereafter with housing provided onbase for military operations personnel. Different housing scenarios are considered under the Proposed Action. Corresponding changes in traffic patterns under these different scenarios are evaluated in the following analysis.

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible	☐	
Low	◦	•
Moderate	○	●
High	◯	⬤
Beneficial Effects	▒	

Note: Some resource elements may have both beneficial effects and adverse impacts.

TRANSPORTATION

ELEMENT/AFFECTED INTEREST	PROGRAM IMPACTS (LOCAL)											
	SHORT DURATION						LONG DURATION					
	PROPOSED ACTION						PROPOSED ACTION					
	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
ROADS	⬤	⬤	⬤	⬤	⬤	⬤	◦ ▒	⬤ ▒	⬤ ▒	◦ ▒	● ▒	◦ ▒
GREAT FALLS	⬤	⬤	⬤	⬤	⬤	⬤		⬤	⬤		•	
LEWISTOWN												
CONRAD												
DEPLOYMENT AREAS	◦	◦	◦	◦	◦	◦	◦ ▒	◦ ▒	◦ ▒	◦ ▒	◦ ▒	◦ ▒
PUBLIC TRANSPORTATION												
RAILROADS												
AIRPORTS												

EM4/3

FIGURE 4.3.2-1 LOCAL IMPACTS TO TRANSPORTATION ASSOCIATED WITH THE PROPOSED SMALL ICBM PROGRAM IN MONTANA

Deployment area construction would begin in the year 1990 with 215 workers making an estimated 160 passenger-car equivalent trips to the site. Construction activity would increase in intensity during 1991 through 1993 with an average of 330 workers making 245 trips during the peak hour, diminishing to 150 workers making 110 trips in 1994, and all construction completed by the fall of 1995. Construction would peak in calendar year 1993 with the modification of 30 Minuteman launch facilities. Table 4.3.2-1 shows peak-hour trip estimates of construction and operations personnel by year.

Additional heavy vehicles would be needed to facilitate construction activities and to transport construction materials and aggregate. The estimated daily movements of heavy construction vehicles such as haul trucks and construction equipment are shown in Table 4.3.2-2. The additional heavy vehicle traffic that is expected to occur during the peak hour is derived based on an 8-hour operation per day. They were allocated in proportion to the estimated workforce likely to commute from each of the three major communities of Great Falls, Lewistown, and Conrad, where likely increases in population could be absorbed.

Maintenance and security vehicles required during the operations phase of the Small ICBM include crew replacement vehicles, security, refueling, safety, and service utility vehicles. The frequency of trips generated by these vehicles, including HML movements to the base for maintenance, are given in Table 1.3.2-1 (Section 1.3.2).

City of Great Falls. With the construction of all programmed military family housing onbase, short-duration impacts on roads would be high and significant. This is expected to occur as a result of additional traffic producing more adverse effects on the 15th Street bridge, River Drive (U.S. 87 Bypass), and 10th Avenue South (portions of which are already at a degraded LOS). Long-duration impacts would be negligible because additional traffic by operations personnel residing offbase which are expected to commute via 10th Avenue South, could use alternate routes such as 1st Avenue North.

Most of the construction workers and operations personnel that will reside offbase would most likely settle in the southern (south of 10th Avenue South) and northern (Black Eagle area) sectors of the city, with some also expected to settle in the east-central part of the city adjacent to the base. They are expected to commute to the base via 10th Avenue South, 2nd Avenue North, 15th Street, and U.S. 87 Bypass (River Drive and 57th Street). Three access points to the base have been assumed. These are the commercial gate through 10th Avenue North, the main gate through 2nd Avenue North, and the south gate along U.S. 87/89 where most construction workers are expected to commute to the worksites. Consequently, the largest change in LOS related to base construction would occur along 10th Avenue South and U.S. 87 Bypass.

An estimated 785 construction workers are expected to settle in Great Falls in 1990, generating an additional 715 passenger-car trips and 25 heavy construction vehicles to the base during the peak hour. This could affect the section of 10th Avenue South between 2nd Street and 13th Street, which is estimated to change from LOS E to F; the section between 13th Street and 26th Street, which is expected to further degrade at LOS F; and the sections between 26th, 38th Street, Street and 57th Street, which could drop from LOS C to E and B to C. The LOS along 15th Street from the Black Eagle area to River Drive is expected to drop from LOS C to D with accompanying congestion occurring over the bridge. River Drive between 15th Street and 10th Avenue North, and 2nd Avenue North between 38th Street and 57th Street, could also drop from LOS A to B. Slight increases in queue lengths and delays could occur at the entrance to the main gate even if most of the construction workers use the south gate along U.S. 87/89.

Table 4.3.2-1

Estimated Number of Peak-Hour Vehicle Trips Made by Construction and Operations Personnel by Calendar Year

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Proposed Action											
To Malmstrom AFB											
Programmed Housing	715	490	845	755	525	470	565	410	270	265	265
Housing Option H1	715	490	845	865	805	1,035	1,365	1,210	1,070	1,065	1,065
Housing Option H2	715	625	1,450	1,655	1,595	1,825	2,155	2,000	1,865	1,855	1,855
To Deployment Area (Construction Only)	160	250	240	245	110	15	0	0	0	0	0
Alternative 1											
To Malmstrom AFB	705	470	765	665	495	450	490	335	200	190	190
To Deployment Area (Construction Only)	160	270	270	265	120	20	0	0	0	0	0
Alternative 2											
To Malmstrom AFB	730	515	910	820	495	390	550	660	650	550	430
To Deployment Area (Construction Only)	170	280	320	325	225	55	0	0	0	0	0
Alternative 3											
To Malmstrom AFB	715	490	845	755	525	470	565	410	270	265	265
To Deployment Area (Construction Only)	160	250	240	245	110	15	0	0	0	0	0
Proposed Action With Rail Garrison											
To Malmstrom AFB	715	490	990	1,035	800	765	865	710	575	565	565
To Deployment Area (Construction Only)	160	250	240	245	110	15	0	0	0	0	0

Table 4.3.2-2

Heavy Construction Traffic for the Small ICBM Program Proposed Action and Alternatives

	1990	1991	1992	1993	1994	1995
Proposed Action						
Malmstrom AFB						
Haul Trucks (ADT)	32	72	24	24	24	
Construction Equipment per Day	175	141	112	104	48	
Deployment Area						
Haul Trucks (ADT)	184	208	152	152	96	16
Construction Equipment per Day	197	246	273	214	108	19
Alternative 1						
Malmstrom AFB						
Haul Trucks (ADT)	32	72	24	24	24	
Construction Equipment per Day	175	141	112	104	48	
Deployment Area						
Haul Trucks (ADT)	184	208	152	152	96	16
Construction Equipment per Day	104	154	211	168	78	16
Alternative 2						
Malmstrom AFB						
Haul Trucks (ADT)	32	72	24	32	32	
Construction Equipment per Day	176	152	128	121	55	
Deployment Area						
Haul Trucks (ADT)	192	208	152	160	104	16
Construction Equipment per Day	147	234	307	285	171	44
Alternative 3						
Malmstrom AFB						
Haul Trucks (ADT)	32	72	24	24	24	
Construction Equipment per Day	175	141	112	104	48	
Deployment Area						
Haul Trucks (ADT)	184	208	152	152	96	16
Construction Equipment per Day	197	246	273	214	108	19

Service levels along this section of U.S. 87/89 is expected to change from LOS B to C. These conditions would continue over the construction phase and would represent a short-duration, high, and significant impact.

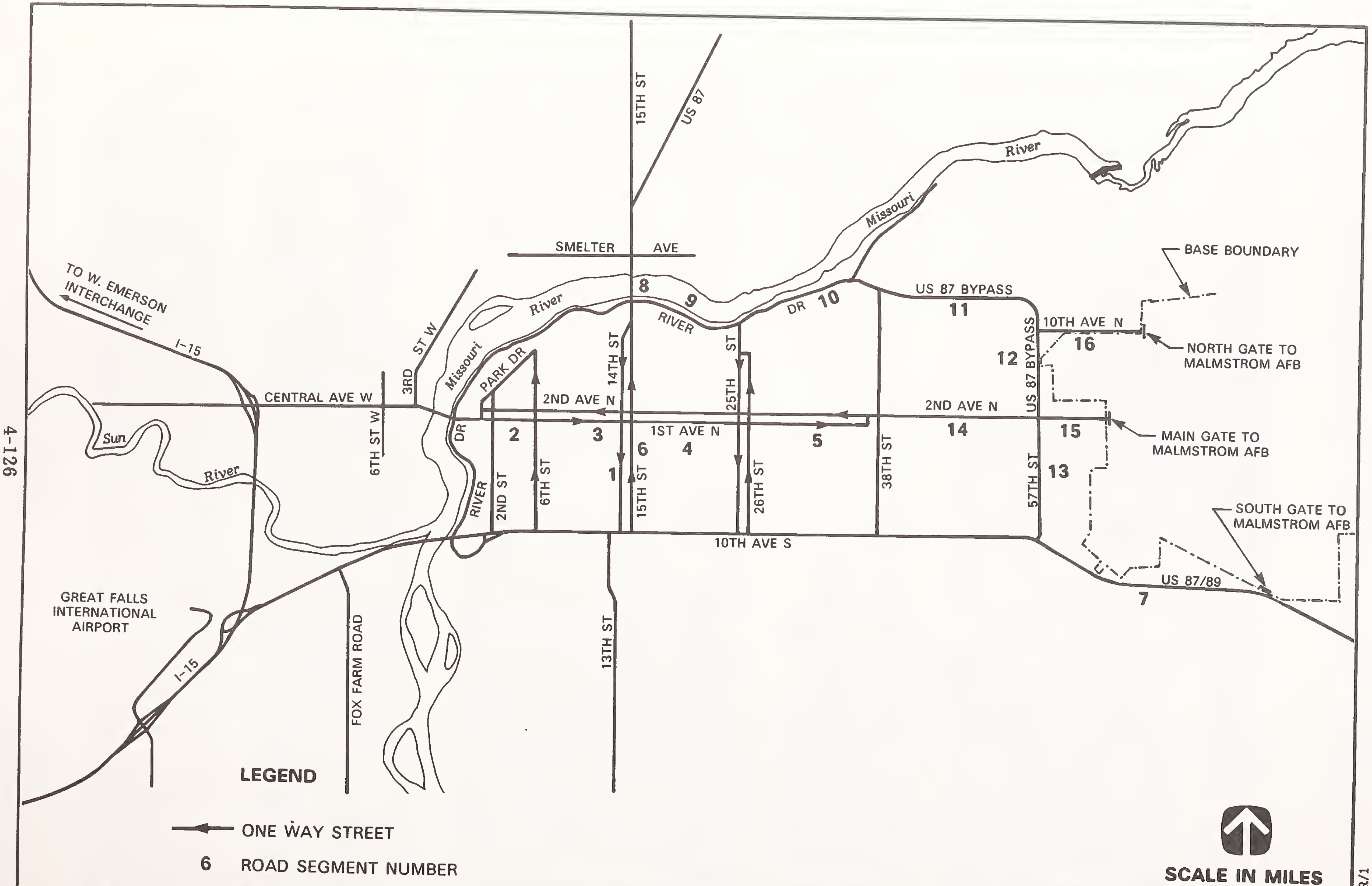
During the operations phase, some 290 personnel residing offbase would generate 265 passenger car trips to the base during the peak hour. Most of these personnel are expected to reside in the area south of 10th Avenue South and therefore would commute via 10th Avenue South to the base. However, by the year 2000, sections of 10th Avenue South are projected to be at LOS E and F even without the program. The additional peak-hour program-generated traffic which is expected to use this route could commute to the base via alternate routes such as 1st Avenue North and Central Avenue without causing an adverse effect on the urban traffic conditions. Long-duration impacts for the Proposed Action with programmed housing are therefore considered to be negligible. Program-related long-duration changes in LOS along selected urban road segments in Great Falls are shown in Figure 4.3.2-2 and Table 4.3.2-3.

Housing Option H1. Under this proposed housing option, which provides only one-half of programmed military family housing onbase, more additional trips would occur, particularly to the base during the peak hour. This would result in both short- and long-duration, high, and significant impacts because of the measured delay and congestion and further reduction in service levels along 10th Avenue South, the 15th Street bridge, and River Drive (U.S. 87 Bypass).

Until 1992, program impacts under Housing Option H1 would be the same as for the Proposed Action with programmed housing. Program impacts would increase when operations personnel begin to move in and settle in Great Falls. An additional 845 passenger-car equivalent trips to the base would be induced within Great Falls during the peak hour in 1992, increasing to 1,365 in 1996, and leveling to 1,065 in the year 2000 when all of trips are generated by operations personnel. These would result in a drop from LOS C to D, along 15th Street from the Black Eagle area to River Drive, from LOS A to B, along River Drive from 15th Street to 10th Avenue North, and from LOS B to C, along 57th Street from 10th Avenue South to 2nd Avenue North. Increased queue lengths and delays at the main gate are expected to occur even if most construction workers at the base use the south gate entrance along U.S. 87/89. The largest impact would occur along 10th Avenue South which is projected to be already at degraded operations levels of LOS E and F, and would handle most of the additional program-related traffic. Short-duration impacts are considered to be high and significant.

Service operations levels would further degrade by the year 2000 along 15th Street (LOS C to E), River Drive (LOS A to B and B to C), 2nd Avenue North leading to the main gate (LOS B to D), and 57th Street between 10th Avenue South and 2nd Avenue North (LOS B to D). At the same time, service along 10th Avenue South will further degrade at LOS F with more additional personnel commuting to the base during the operations phase. Figure 4.3.2-2 and Table 4.3.2-3 show program-related long-duration changes in LOS along selected urban roads in Great Falls. This results in long-duration, high, and significant impacts.

Housing Option H2. Under this proposed housing option providing no military family housing onbase, most of the needed construction and operations personnel would settle within Great Falls and would generate a greater traffic impact than with the other housing options. This would result in both short- and long-duration, high, and significant traffic impacts in Great Falls as a result of further degradation of service operations along the 15th Street bridge, River Drive (U.S. 87 Bypass), and 10th Avenue South.



Note: For level of service changes, see Table 4.3.2-3.

FIGURE 4.3.2-2 SELECTED ROAD SEGMENTS IN THE GREAT FALLS URBAN AREA

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Table 4.3.2-3

Program-Related, Long-Duration Changes in
Level of Service Along Selected Road Segments in the Great Falls Urban Area

Road Section	Number	Proposed Action	Housing Option		Alternative			Proposed Action With Rail Garrison
			H1	H2	1	2	3	
6th Street								
From 10th Avenue South to 1st Avenue North	1	B-B	B-C	B-C	B-B	B-B	B-B	B-B
1st Avenue North								
From Park Drive to 6th Street	2	D-D	D-D	D-D	D-D	D-D	D-D	D-D
From 6th Street to 15th Street	3	C-C	C-C	C-D	C-C	C-C	C-C	C-C
From 15th Street to 26th Street	4	A-A	A-A	A-B	A-A	A-A	A-A	A-A
From 26th Street to 37th Street	5	A-A	A-A	A-B	A-A	A-A	A-A	A-A
15th Street								
From 10th Avenue South to 1st Avenue North	6	B-B	B-C	B-C	B-B	B-C	B-B	B-C
U.S. 87/89								
From 57th Street to South Gate of Malmstrom AFB	7	B-B	B-C	B-D	B-B	B-C	B-B	B-C
15th Street								
From Smelter Avenue to River Drive	8	C-C	C-E	C-F	C-C	C-D	C-C	C-D

Table 4.3.2-3 Continued, Page 2 of 2

Road Section	Number	Proposed Action	Housing Option		Alternative			Proposed Action With Rail Garrison
			H1	H2	1	2	3	
River Drive/U.S. 87 Bypass								
From 15th Street to 25th Street	9	A-A	A-B	A-D	A-A	A-A	A-A	A-A
From 25th Street to 38th Street	10	B-B	B-C	B-D	B-B	B-B	B-B	B-B
From 38th Street to 10th Avenue North	11	A-A	A-B	A-C	A-A	A-A	A-A	A-B
From 10th Avenue North to 2nd Avenue North	12	A-A	A-B	A-C	A-A	A-A	A-A	A-A
From 2nd Avenue North to 10th Avenue South	13	B-B	B-D	B-F	B-B	B-C	B-B	B-C
2nd Avenue North								
From 38th Street to 57th Street (U.S. 87 Bypass)	14	A-A	A-B	A-B	A-A	A-B	A-A	A-B
From 57th Street (U.S. 87 Bypass) to Main Gate	15	B-B	B-C	B-C	B-B	B-B	B-B	B-C
10th Avenue North								
From 57th Street (U.S. 87 Bypass) to Commercial Gate	16	A-A	A-B	A-C	A-A	A-A	A-A	A-B

Until 1992, program impacts would be the same as for the other housing options, but after 1992, greater population increases are expected to occur within Great Falls as a result of more operations personnel residing offbase. An additional 1,450 passenger-car trips to the base would be induced within Great Falls during the peak hour in 1992, increasing to 2,155 in 1996, and leveling at 1,855 in the year 2000. These would result in changes in service operations from LOS C to E, along 15th Street from the Black Eagle area to River Drive, from LOS A to C, along River Drive from 15th Street to 10th Avenue North, from LOS A to C and B to D, along 2nd Avenue North from 38th Street to the main gate, and from LOS B to E, along 57th Street from 10th Avenue South to 2nd Avenue North. Appreciable increases in queue length and waiting time in entering the base at the main gate would occur even if most of the construction workers use the south gate along U.S. 87/89. These conditions would persist to the year 2000 including the further degradation of service to LOS F along 57th Street between 10th Avenue South and 2nd Avenue North and along 10th Avenue South, which is already at LOS F. Figure 4.3.2-2 and Table 4.3.2-3 show program-related long-duration changes in LOS along selected urban road segments in Great Falls. This would result in both short- and long-duration, high, and significant impacts for this housing option.

City of Lewistown. The City of Lewistown is expected to be affected by deployment area construction activities which could start in the year 1991 under the assumed scenario with an estimated 30 workers making some 25 passenger-car equivalent trips to the worksites during the peak hour. This is estimated to increase to 110 trips during the peak hour in 1992, 100 in 1993, 80 in 1994, and drop to 10 in 1995. Consequently, only a slight increase in traffic is expected to occur along sections of Main Street (also part of U.S. 87) at LOS B and C without a change in service levels. This represents both a short- and long-duration, negligible impact on roads in Lewistown.

City of Conrad. The City of Conrad is expected to be primarily affected by deployment area construction activities which could start in the year 1991 under the assumed scenario with an estimated 30 workers making 25 passenger-car equivalent trips during the peak hour to the worksites. This is estimated to increase to 40 peak-hour trips in 1992, 70 in 1993, 40 in 1994, and drop to 10 in 1995. This would result in an increase in peak-hour flow along Main Street (also part of Business Route 15) but without a change in service level at LOS B. This represents a short- and long-duration, negligible impact on roads in Conrad.

Deployment Area Roads. Both short- and long-duration impacts along the T/E route network are expected to be low and not significant because projected baseline traffic would be low and the LOS would not be reduced below minimum desirable standards. Long-duration impacts would also be beneficial as a result of road and bridge improvements.

Short-duration changes in service operation levels on rural roads are principally affected by movement of construction workers, materials and equipment, and the interference created on the flow of traffic caused by needed road and bridge improvements along T/E routes. Total additional trips generated by the program in 1990 are estimated at 160 trips during the peak hour, an average of 245 in 1991 through 1993, 110 in 1994, and 15 in 1995. Traffic impacts on rural roads were evaluated based on an allocation of construction workers commuting from the three major communities of Great Falls, Lewistown, and Conrad, which are likely to absorb possible population increases.

In addition, movement of construction equipment and haul trucks would increase traffic along the T/E route network. Heavy construction traffic estimates for the Proposed

Action and alternatives are given in Table 4.3.2-2. Total daily program estimates were distributed to the three general areas of deployment construction activity (i.e., around Great Falls, Lewistown, and Conrad) according to the estimated workforce in the general area.

Substantial changes in service operation levels could occur mostly on the main highways where commuting to the different construction sites could occur simultaneously during the peak hour. Consequently, the LOS is expected to change only on sections of U.S. 87 and 89 around Great Falls and Lewistown. U.S. 89, west of Vaughn, is projected to change from LOS B to C; U.S. 87/89, east of Great Falls to Belt, would drop from LOS B to C; and the section of U.S. 87 from Belt to Lewistown would drop from LOS A to B. Short-duration impacts on rural roads during the construction phase are thus considered low and not significant.

Information obtained from continuous traffic recorders within the region shows only normal seasonal fluctuations and no distinct or marked increase in traffic flow brought about by additional vehicles used during the harvest season. Grain is usually hauled into storage bins in the locality and shipped to the market when the rates are good. It is therefore anticipated that program-related traffic would not cause adverse effects in the movement of agricultural products in the region.

The Proposed Action requires that the existing T/E routes be able to accommodate the specifications of the HML. The T/E routes must have adequate surface condition and width. In order to support the Small ICBM traffic operations, a number of road and bridge improvements have been identified as part of the Proposed Action. For purposes of this analysis, it is assumed that some intersections would have to be widened, some culverts may have to be replaced, and 124 bridges would need to be improved. Eight of these bridges are located along Interstate 15, 83 are along Federal-aid primary highways, 20 are along Federal-aid secondary highways, 12 are along local roads, and 1 is on a city street in Great Falls.

Construction activities to upgrade the T/E routes, including certain bridges, would have short-duration, low, and not significant impacts but would have a long-duration beneficial effect. Only a short-duration delay around road and bridge improvements would occur, but long-duration beneficial impacts would result from the upgrading of these facilities.

During the operations phase, program-related traffic to the deployment area would include crew replacement vehicles, occasional HML movements to the base, and security, refueling, service utility, safety, and patrol vehicles. The sections of the T/E route network that would most probably be affected by operations vehicles are the main roads leading to the base, particularly Interstate 15 and U.S. 87 and 89, where commuting could occur simultaneously. Farther from the base, these vehicles would disperse to launch facilities and thus cause lower effects on the traffic. The frequency of movements of these vehicles is given in Table 1.3.2-1 (Section 1.3.2). Along U.S. 87/89 between the U.S. 87 Bypass in Great Falls and Montana State Highway 227, an additional 275 vehicle trips per day are estimated to be generated by crew replacement and service vehicles. Similarly, an additional 235 vehicle trips per day would occur along Interstate 15 between Great Falls and Vaughn (Junction U.S. 89). These would reduce the LOS along this section of U.S. 89 from B to C and along Interstate 15 from A to B. This will result in a low LOI because of operations traffic to the deployment area.

The movement of the HMLs over public roads to and from the launch facilities and Malmstrom AFB for regular maintenance and repairs was assessed based on the

assumption that each launch facility could be a potential site for the HMLs. Figure 4.3.2-3 shows the potential frequency of HML trips occurring along the major primary highways in the deployment area. For example, the section of U.S. 87/89 between the U.S. 87 Bypass and Montana State Highway 227 has the probability of accommodating 200 HML trips per year, and along Interstate 15 between Great Falls and the U.S. 89 junction at Vaughn, 170 HML trips could be expected each year. Elsewhere, the frequency is expected to be much lower. The presence of these vehicles on the road could create interference and delays to traffic flow resulting from the relatively slow movement of the HML and its support vehicles. Some degree of annoyance and discomfort to road users by requiring them to stop along shoulders is also expected to occur. However, the volume of traffic along the T/E routes is very low, and the additional HML trips and crew replacement, service, and security vehicles would not reduce the LOS below substandard levels. Although annoyance and delays could be experienced, they would only occur occasionally on short segments of deployment area roads. Consequently, long-duration impacts to deployment area roads are judged to be low and not significant.

4.3.2.2 Public Transportation

Program-related demand for public transportation in Great Falls is expected to result from increases in population and associated new housing caused by the proposed program. The projected demand for bus and taxi service by the program-induced population is likely to be low and could easily be handled within the current capacity. The short- and long-duration impact on public transportation is therefore considered to be negligible.

It is unlikely that the current or anticipated service is adequate to attract program employee work trips. Bus routes are very limited and the long intervals between buses offer a poor transportation alternative. Program-related employees may occasionally use taxi service for convenience, and this may increase taxi demand. This increase is estimated to be low and would therefore not substantially affect taxi response and service within Great Falls. Income levels of program-related employees indicate a low demand for intercity bus service. The increased level of economic activity would probably result in limited demand increases. In general, the short- and long-duration impact on public transportation within Great Falls would be negligible.

4.3.2.3 Railroads

The existing rail system is operating at well under capacity and could handle additional shipments related to the program such as shipment of reentry vehicles, HMLs, and construction materials. At the Burlington Northern railyard in Great Falls, any anticipated increase in use can readily be handled within its operating capacity. This represents both a short- and long-duration, negligible impact on railroads.

4.3.2.4 Airports

Great Falls International Airport. Increase in air traffic operations at Great Falls International Airport could occur as a result of increased corporate and private air traffic related to the program such as program-related manufacturers and contractors, government agencies, and high technology companies, and of the additional use of helicopters and small aircraft by the contractors. Great Falls International Airport is operating at well below its capacity and therefore is expected to handle any anticipated additional air traffic without construction of new or expanded facilities. Short- and

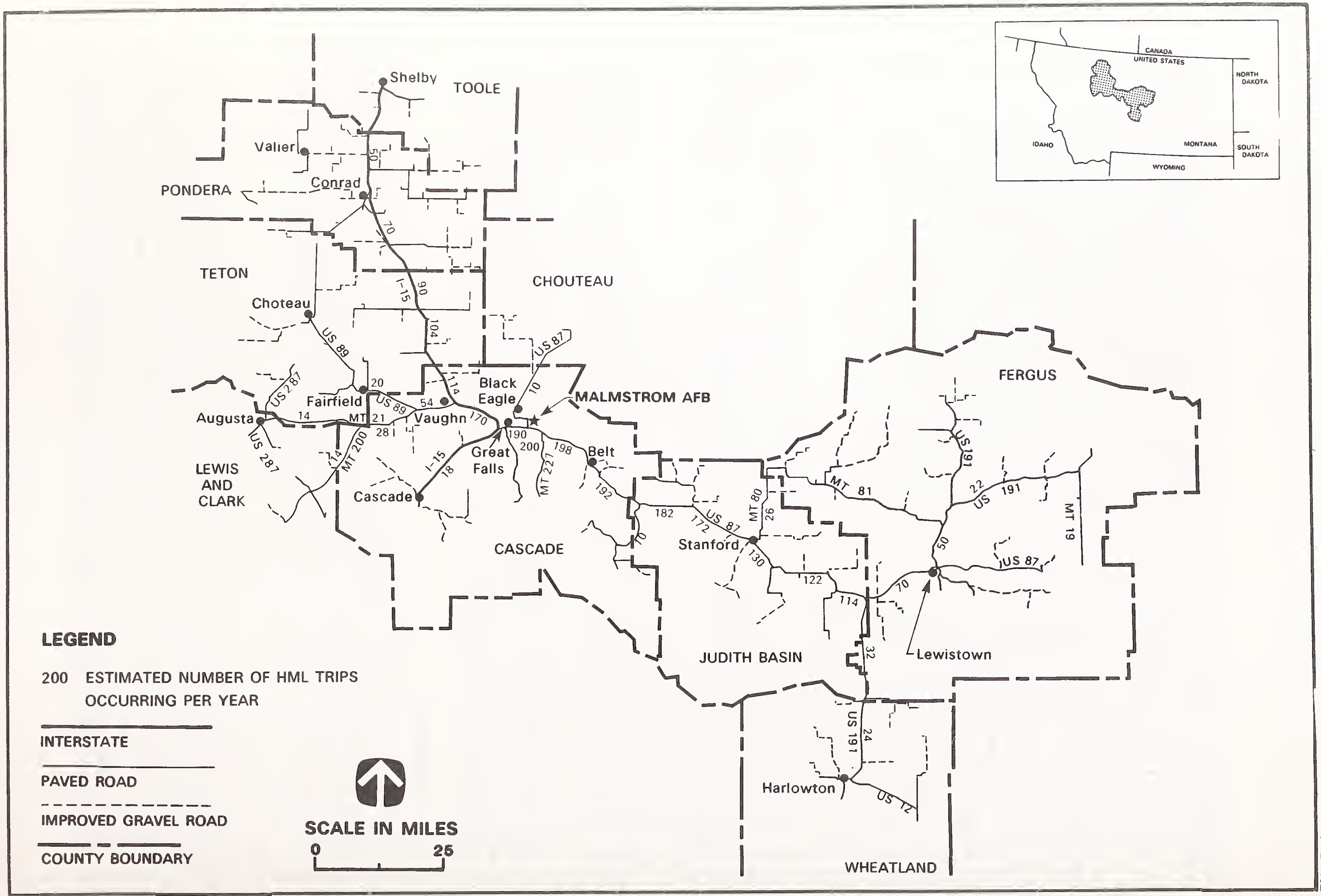

FIGURE 4.3.2-3 ESTIMATED NUMBER OF HARD MOBILE LAUNCHER TRIPS PER YEAR ALONG MAJOR TRANSPORTER/ERECTOR ROUTES

long-duration, negligible impacts to air traffic are expected since there would be no restrictions on overflights beyond those normally applied by the Federal Aviation Administration.

Other Area Airports. Because of their location within the deployment area, air traffic at Conrad (Pondera County) Airport and Lewistown Municipal Airport could also increase as the result of program-related uses of air facilities, especially by helicopters and small aircraft by contractors. However, these are considered to be minimal and would not require any construction of new or expanded facilities. Both short- and long-duration impacts on air traffic at these airports are considered to be negligible.

4.3.3 Impacts of Alternatives

Overall short-duration impacts on roads would be high and significant for all alternatives (Section 4.3.2, Figure 4.3.2-1). Long-duration impacts would be low and not significant for Alternatives 1 and 3 but moderate and significant for Alternative 2. Long-duration impacts for all alternatives would also be beneficial as a result of road and bridge improvements. All impacts to public transportation, railroads, and airports are rated negligible.

4.3.3.1 Roads

Alternative 1. Alternative 1 would require fewer construction and operations personnel than the Proposed Action, resulting in less additional traffic on the roads during the peak hour. From 1990 to 1991, the estimated manpower requirements are almost the same as for the Proposed Action, and would therefore result in the same LOI. From 1992, manpower requirements are lower than for the Proposed Action, generating less additional program-induced traffic. It is estimated that some 765 additional passenger-car trips would be made during the peak hour in 1992, decreasing to 450 in 1995, and leveling at 190 in the year 2000 when they are all induced by operations personnel. This results in the reduction of service levels from LOS C to D along 15th Street from the Black Eagle area to River Drive, from LOS A to B along River Drive from 15th Street to 2nd Avenue North, from LOS A to B along 2nd Avenue North from 38th Street to 57th Street, and from LOS B to C along 57th Street from 10th Avenue South to 2nd Avenue North. Service levels along 10th Avenue South would drop from LOS E to F between 2nd Street and 13th Street, and would further degrade to LOS F between 15th Street and 26th Street. These levels are expected to persist through 1996 resulting in a short-duration, high, and significant impact. Beyond 1998, impacts on roads would be reduced because only about 190 passenger car trips would be made to the base. As with the Proposed Action, the long-duration impact on roads in Great Falls by Alternative 1 is considered negligible.

Commuting to the deployment area is estimated to be slightly greater than for the Proposed Action. Table 4.3.2-1 (Section 4.3.2) shows the estimated peak-hour vehicle trips made by construction workers in the deployment area. However, the increase does not reduce the LOS lower than that of the Proposed Action. Impacts on deployment area roads are expected to be the same as for the Proposed Action. Both short- and long-duration impacts would be low and not significant because program-related traffic would not reduce the LOS below minimum desirable standards. Long-duration impacts would also be beneficial as the result of road and bridge improvements. Short- and long-duration impacts on roads in Lewistown and Conrad would also be negligible.

Alternative 2. Alternative 2 with onbase military family housing would require a slightly higher number of construction and operations personnel than the Proposed Action and therefore would result in more additional traffic on the roads during the peak hour. Assignment of these workers in the community and on the principal arteries of Great Falls increases the volume of traffic and reduces the service levels. During the construction phase, changes in LOS for Alternative 2 are expected to be the same as for the Proposed Action. During the operations phase, about 430 passenger car trips are expected to be made to the base resulting in the reduction of service from LOS C to D along 15th Street from Smelter Avenue to River Drive. Consequently, short-duration impacts on roads in Great Falls by Alternative 2 would be high and significant; long-duration impacts are considered moderate and significant.

Commuting to the deployment area during the peak hour under this alternative is estimated to be greater than for the Proposed Action. Table 4.3.2-1 (Section 4.3.2) shows the estimated peak-hour vehicle trips made by construction workers in the deployment area by calendar year. This, however, would not further reduce the LOS lower than that for the Proposed Action. Alternative 2 would therefore have the same degree of short- and long-duration impacts as the Proposed Action: low and not significant. The long-duration beneficial impacts of road and bridge improvements would remain. Short- and long-duration impacts on roads in Lewistown and Conrad would also be negligible.

If no military family housing were built onbase, there would be greater daily commuting from areas within Great Falls to Malmstrom AFB. Compared to the Proposed Action with Housing Option H2, about 395 additional vehicle trips would be generated during peak hours for the operation phase. This would result in total peak trips of 2,250, or an increase of 20 percent over the Proposed Action with Housing Option H2 level of 1,855. Long-duration impacts on roads would be high and significant due to the level of congestion and delay on several major arterials leading to the base.

Alternative 3. Alternative 3 would require the same number of construction and operations personnel as the Proposed Action. The impacts on roads affected by Alternative 3 would therefore be the same as with the Proposed Action. Short-duration impacts on roads in Great Falls would be high and significant; long-duration impacts would be negligible. On deployment area roads, both short- and long-duration impacts would be low and not significant. The long-duration beneficial impacts of road and bridge improvements would remain. Short- and long-duration impacts on roads in Lewistown and Conrad would be negligible.

4.3.3.2 Public Transportation

Alternative 1. The number of construction and operations personnel residing offbase under Alternative 1 would be smaller than for the Proposed Action. This would result in lower demand for the use of buses and taxis than with the Proposed Action. Short- and long-duration impacts on public transportation for Alternative 1 would still be negligible.

Alternative 2. The number of construction and operations personnel residing offbase would be greater than that for the Proposed Action. A higher demand for the use of public transportation would be generated under Alternative 2 with programmed housing onbase than with the Proposed Action. This is estimated to still be within the available capacity of the bus and taxi systems in Great Falls and would not require additional vehicles or require a major change in service operations and schedules. Alternative 2 would therefore have a short- and long-duration, negligible impact on public transportation.

Alternative 3. As with the Proposed Action, short- and long-duration impacts on public transportation would be negligible.

4.3.3.3 Railroads

Alternative 1. Program-induced demand for rail transportation is expected to be the same as for the Proposed Action. The short- and long-duration impacts on railroads would therefore be negligible for Alternative 1.

Alternative 2. Program-induced demand for rail transportation would be slightly greater than for the Proposed Action due to the greater number of HMLs proposed for Alternative 2. This, however, is not expected to require additional terminal or control facilities or even a major change in service operation and schedules. Alternative 2 would also have short- and long-duration, negligible impacts on railroads.

Alternative 3. As with the Proposed Action, short- and long-duration impacts on railroads would also be negligible.

4.3.3.4 Airports

Both short- and long-duration impacts on airports for Alternatives 1, 2, and 3 would be negligible as for the Proposed Action. Only slight changes in air transport demand would result but without the need for modifications in schedules or levels of operation or the need for new facilities.

4.3.4 Cumulative Impacts

4.3.4.1 Roads

Concurrent deployment of the Proposed Action with the Peacekeeper in Rail Garrison would generate an increase in additional traffic induced by personnel related with the Rail Garrison system starting in 1992 under the assumed scenario. An additional 145 vehicle trips made by Rail Garrison personnel are expected during the peak hour in 1992. This would increase to 280 additional vehicle trips in 1993 and 300 in 1996 and thereafter. This, in addition to the traffic generated under the Proposed Action, would further exacerbate the LOS along the principal arteries leading to the base. Short-duration impacts on roads in Great Falls would therefore remain high and significant as for the Proposed Action. During the operations phase, the additional traffic generated by the Rail Garrison operations personnel would reduce the LOS from C to D along 15th Street from Smelter Avenue to River Drive and from E to F along 10th Avenue South from 6th Street to 13th Street. These represent long-duration, moderate, but significant impacts. Long-duration impacts would also be beneficial as a result of road and bridge improvements.

Short-duration impacts on rural roads would be the same as for the Proposed Action: low and not significant. Long-duration impacts would also remain low but significant. The cumulative short- and long-duration impacts on roads in Lewistown and Conrad would also be negligible.

4.3.4.2 Public Transportation

An increase in the use of public transportation in Great Falls would be generated by the additional Rail Garrison personnel. The total cumulative demand for the use of public transportation would still be low and could easily be accommodated within the current capacity. The cumulative short- and long-duration impact on public transportation would still be negligible.

4.3.4.3 Railroads

The short- and long-duration impacts on railroads of the Proposed Action were considered to be negligible. Since only cumulative effects of the additional personnel required for the Rail Garrison were considered, the short- and long-duration impacts on railroads would still be negligible. If Malmstrom AFB is selected as a Rail Garrison location, a separate environmental impact statement would be prepared and impacts on railroads would be addressed specifically.

4.3.4.4 Airports

A slight increase in the use of airport facilities would also be generated but this would still be minimal to require any changes in the level of operations. The cumulative short-a8d long-duration impact on airports would still be negligible.

4.3.5 Impacts of the No Action Alternative

Road traffic demand through the year 2000 was estimated based upon population projections made by the socioeconomics resource. A study of the population projections, historical trends of daily traffic flows, and planning horizons (indicated in the comprehensive plans of cities and counties in the region) formed the basis of estimating traffic trends without the program. It is estimated that there will be low road traffic demand under baseline future conditions. Though traffic volumes will increase during these years, there will be no change in LOS categories and motorists will perceive no significant change in traffic operations except along 10th Avenue South in Great Falls which is projected to be at LOS F.

Assuming Minuteman T/E routes continue to be used, their physical conditions will remain essentially unchanged and adequate for Minuteman operations activities.

4.3.6 Potential Mitigation Measures

Potential mitigations are measures that could be undertaken to reduce or eliminate program impacts. All, some, or none of the measures identified for transportation may be implemented. For each measure, the agencies that may be involved in implementation are identified. The U.S. Air Force would encourage implementation of these measures through environmental awareness and other programs. Potential mitigation measures for transportation include the following:

- Schedule work hours for program-related employees to avoid commuting during normal traffic peak hours (U.S. Air Force and its contractors).

- Advertise the schedule for major road and bridge improvements to allow the affected public the opportunity to avoid routes that may cause avoidable delays and annoyance (U.S. Air Force and its construction contractors).

- Improve the section of 10th Avenue North leading to the commercial (north) gate, if programmed military housing is constructed. This measure would be effective in increasing the capacity along this roadway section, and will reduce traffic through the main gate (Cascade County Highway Department).

- Institute transportation management measures to improve quality of service in traffic operations, particularly on urban arteries. Typical transportation management measures are the use of reversible traffic flows, one-way street couplets, installation of traffic signals, and signal coordination (City of Great Falls and Cascade County).

4.3.7 Irreversible and Irretrievable Resource Commitments

The increase in vehicular traffic, most particularly heavy commercial vehicles associated with the proposed program, would result in accelerated deterioration of the physical condition of the roads as well as the service levels on those roads. Considering that deficient roads and bridges would be improved, there would be no irreversible or irretrievable resource commitments for transportation.

4.3.8 Relationship Between the Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Short-duration, program-generated traffic would result in some decrease in the comfort, convenience, and safety afforded regional users of primary roads, and some economic losses to travelers and shippers. The associated road and bridge construction and the increased road maintenance levels on deployment area roads would improve traffic flow in the region and would be beneficial in terms of driver safety, reduced maintenance costs, and vehicle operating costs. In terms of the natural environment, minimal disturbance is expected after completion of program activities.

4.4 Land Use

Deployment of the Small Intercontinental Ballistic Missile (ICBM) has the potential to modify some existing land uses at a site and/or local level within the Region of Influence (ROI). The land use resource consists of two elements: urban and rural land use. The rural land use element is divided into two subelements: land use and inhabited structures within explosive safety zones.

4.4.1 Impact Analysis Methodology

The impact analysis methodology for land use involved three separate procedures: evaluation of program impacts, determination of levels of impact (LOI), and determination of the significance of impacts. The methodology also included consideration of a number of assumptions and assumed mitigations. Impacts were evaluated at the site and local levels and an overall collective assessment was made for each resource element. Site-level impacts to rural land use were evaluated at launch facilities and along transporter/erector (T/E) routes. Local impacts to urban land use were evaluated for Great Falls, Lewistown, and Conrad.

4.4.1.1 Evaluation of Program Impacts

Urban Land Use. The construction of new housing on vacant developable land in the urban areas of Great Falls, Lewistown, and Conrad would be the predominant land use impact. Any increased business, commerce, industrial, or other related activities generated as a result of the proposed program are anticipated to be absorbed by existing commercial and/or industrial property through the utilization of existing office, store, and building space together with land already platted to accommodate any new construction. The analytical methods utilized to evaluate program-induced impacts are similar to those used for determining projected conditions. The amount of land needed to accommodate the program-induced inmigration in the above-mentioned communities was projected using per capita standards. A qualitative professional judgment was made to determine whether the program-related impacts can be absorbed within the existing zoning ordinances and be consistent with the adopted city-county comprehensive plans. The land use analysis was predicated on the premise that local decision-makers would enforce existing plans, policies, and ordinances; therefore, future development would be compatible with existing plans, policies, and ordinances.

Land required for future residential use was estimated. The amount of various types of residential housing needed for the program-related population was multiplied by accepted density factors from each jurisdiction's adopted development standards (i.e., zoning ordinance or subdivision ordinance) and/or the adopted community comprehensive plan. The amount of vacant developable land needed for residential expansion was then determined for each urban area. Residential densities used for analysis are 4.8 units per acre gross for single-family residential, 6 units per acre gross for mobile home parks, and 10 units per acre gross for multiple-family residential.

Densities for single-family residential were based on Great Falls, Lewistown, and Conrad development standards and/or comprehensive plans. The density for multiple-family residential was derived through the use of the low range identified for garden apartments described in the Residential Development Handbook by the Urban Land Institute (1982) and development standards of the above-mentioned jurisdictions. In estimating residential land use, the required change in supply of housing units (i.e., single-family, multiple-family, and mobile home), based on housing projections developed in the socioeconomics

analysis, was multiplied by density factors determined from local conditions and practices (i.e., units per acre gross). The expansion of residential housing may result in a need for additional commercial and industrial facilities. Growth may occur through the expansion of existing facilities, through the establishment of new ones at new locations, or a combination of both. Vacant land absorption was then determined for each community, taking into consideration historical trends and annexation policies.

Future land uses at Malmstrom Air Force Base (AFB) were determined through an analysis of the Base Comprehensive Plan and other documents developed for the Small ICBM program. Expansion of government-built housing, where planned in offbase locations, is also discussed under urban land use.

Rural Land Use. Lands required for use in the physical expansion of launch facilities and the improvement of T/E routes and bridges were addressed. The number of private and public surface landowners was also identified.

The required explosive safety zones were analyzed at distances of 1,250 feet, 1,425 feet, and 1,795 feet from potential Hard Mobile Launcher (HML) locations. The amount of expansion of the safety zones would depend on the type of HML shelter and other siting constraints. The existing Minuteman explosive safety zones are 1,200 feet from the silo door. Since occupied structures are prohibited within explosive safety zones, the number of structures in these expanded areas was considered in evaluating the LOI. Occupied structures include inhabited residences, commercial and industrial structures, and schools.

Land uses within potential launch facility expansion areas were also rated for LOI. The land use types include rangeland, forest classified as nonmarketable timber areas (timber subject to preservation), dry-farmed cropland (cultivated land that is not irrigated), irrigated cropland, and forest classified as marketable timber areas (timber may be subject to harvest). The detailed land use study area did not contain any feed lots or grain elevators.

The required launch facility explosive safety zones were analyzed for all inhabited structures including residences, schools, and commercial structures.

Land uses in the deployment area were analyzed based on interpretation of aerial photographs and existing maps such as those published by the U.S. Geological Survey, the U.S. Soil Conservation Service, the U.S. Forest Service, and local governments. Structures, utilities, roads, and easements were included where appropriate. Rural land use, except in specific locations adjacent to urban areas undergoing conversion, is expected to remain relatively similar to the current mix of uses.

4.4.1.2 Determination of Levels of Impact

Urban Land Use. The LOIs for urban land use were determined by the rate of urbanization of vacant developable land and the consistency with the adopted comprehensive plan. Projections of urban expansion were based on the premise that growth is accomplished through absorption of vacant developable land designated by the comprehensive plan together with policies of the plan that govern its utilization. Therefore, growth is planned to expand through infill of vacant land within the urbanized area as well as growth on vacant land conterminous to the developed area. The rate of urbanization is measured in two ways: the amount of utilization of vacant developable land; and the percent increase of development over the current amount of developed land.

The LOIs for urban land use are the following:

- Negligible Impact -- The proposed program would result in no noticeable change in the rate of urbanization or development patterns beyond the baseline projections (60 acres or less or 2%, whichever is less), or would cause only minor reductions in the supply of vacant developable land; growth would be consistent with the adopted comprehensive plan.

- Low Impact -- The proposed program would cause expansion of urban land uses beyond the baseline projections that would reduce the supply of vacant developable land (60-320 acres or 2-10%, whichever is less) but the development would be consistent with the adopted comprehensive plan.

- Moderate Impact -- The proposed program would cause expansion of urban land uses that would substantially reduce or deplete the supply of vacant developable land (320-640 acres or 10-20%, whichever is less), and may be inconsistent with the adopted comprehensive plan.

- High Impact -- The proposed program would cause expansion of urban land uses that may deplete the supply of vacant developable land (over 640 acres or over 20%, whichever is less), and may require development outside of planned service areas. The new urban growth would be inconsistent with the adopted comprehensive plan.

Rural Land Use. Rural land use would be affected to the extent that program deployment alters the use in the vicinity of the launch facilities as a result of constructing HML facilities, together with the impact placed upon all occupied structures situated within the expanded explosive safety zones. The LOI criteria have been developed both at the regional and at individual launch facility levels.

The LOIs for rural land use were determined by the amount, type, and duration of direct and indirect land use projected for the proposed program in relation to the character of the area where the impact would occur. Direct program impacts include potential interruptions or changes in existing uses and restrictions on current and future land uses.

Indirect impacts include interruption of agricultural activities adjoining T/E routes as a result of potential reduction in access to farms, ranches, and markets.

Where an inhabited structure is located within the expanded explosive safety zone, there are three possible options:

- The owner may sell his or her residence and the associated farm improvements to the Air Force while retaining ownership of the land subject to the Air Force restrictive easement. The Air Force would pay fair market value for the structures and the reduction in the value of the property resulting from the easement. These values would be determined by independent appraisers from the local area or, if unavailable, by appraisers who are familiar with the local realty market. The Air Force would commission and pay for the appraisal. The appraised value is subject to negotiation with the owner. Relocation benefits would also be paid as authorized by law. The owner would be given the opportunity to repurchase the house and improvements at salvage value.

- The owner may sell the house only and retain the farm complex and other uninhabited buildings. The proceeds can be used to build a new residence outside the explosive safety zone.

- The owner who wishes to remain in his or her present residence may request to do so. The Air Force will process a request for exemption to the Secretary of the Air Force. The Secretary of the Air Force has the final decision following a case-by-case analysis. Each homeowner who receives an exemption must acknowledge in writing that he or she understands the requirement for the explosive safety zone, that the Air Force is willing to acquire the structures and provide relocation assistance as provided by law, and that he or she desires to remain in spite the potential risks.

'he LOIs for rural land use are the following:

- Negligible Impact -- For overall impacts, little change in the land use and character of the area or in agricultural productivity (no more than 100 acres [about 610,000 acres in ROI] of irrigated cropland or 200 acres of dry-farmed cropland/rangeland [about 5,500,000 acres in ROI] are disturbed). For site impacts, no relocation of inhabited structures takes place, and/or the disturbed land use type is rangeland.

- Low Impact -- For overall impacts, an interruption or restriction of land use that would not change the character of the area but would result in some interference with agricultural productivity (between 100-500 acres of irrigated cropland [about 610,000 acres in ROI] or 200-1,000 acres of dry-farmed cropland/rangeland [about 5,500,000 acres in ROI] are disturbed and/or relocation or removal of inhabited structures amounts to 1-10 inhabited structures [28 persons] in the ROI). For site impacts, one to four structures at any launch facility would be relocated, and/or the land use type to be disturbed is dry-farmed cropland.

- Moderate Impact -- For overall impacts, an interruption or restriction of land use that would change the character of the area and/or would decrease agricultural productivity on a temporary basis (between 500-1,000 acres of irrigated cropland [about 610,000 in ROI] or 1,000-2,000 acres of dry-farmed cropland/rangeland [about 5,500,000 acres in ROI] are disturbed or the relocation or removal of 11-50 inhabited structures [29-150 persons] takes place in the ROI). For site impacts, five to nine structures at any launch facility would be relocated, or the land use type to be disturbed is irrigated cropland or forest.

- High Impact -- For overall impacts, a permanent change in the land use and character of the area affecting agricultural productivity (more than 1,000 acres of irrigated cropland [about 610,000 acres in ROI] or more than 2,000 acres of dry-farmed cropland/rangeland [about 5,500,000 acres in ROI] or more than 1% of the total acreage devoted to irrigated cropland or dry-farmed cropland or the relocation or removal of inhabited structures amounting to more than 50 structures or 150 persons) takes place in the ROI. For site impacts, more than ten structures at any launch facility would be relocated, or a grain elevator or commercial feedlot may be disturbed.

4.4.1.3 Determination of Significance

The significance of land use impacts were evaluated in accordance with Council on Environmental Quality (CEQ) regulations. Significance was assessed through evaluation of the context and intensity of the impacts. Context includes consideration of the settings (site, local, or regional) and the duration of the impacts. The CEQ regulations provide ten items that should be considered in evaluating intensity. Of these ten items, the following are applicable to the land use resource:

- The degree to which the proposed action affects public health or safety;
- The degree to which the effects on the quality of the human environment are likely to be highly controversial; and
- Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

As an example, the uncontrolled development of housing outside of planned service areas, where sewer and other utility hookups are not available and services are not provided, could pose a threat to public health and could be inconsistent with local growth management plans and policies.

In addition to these considerations, which are specifically identified in the CEQ guidelines, the following considerations are also appropriate for the land use resource:

- The degree to which the action compels residential land development in ways not expressly intended and is therefore inconsistent with the adopted comprehensive plan or zoning regulations; and
- Whether the action will affect inhabited structures within the explosive safety zone.

These intensity considerations and their contexts were used to rate impacts as either significant or not significant.

4.4.1.4 Assumptions and Assumed Mitigations

The following assumptions were made for urban land use:

- Future development would be located where it would be compatible with existing uses, be consistent with adopted comprehensive plans and policies, and be in compliance with local zoning ordinances and development regulations;
- Current local housing preferences would prevail during the baseline growth period;
- Temporary population growth from construction activities would create demand for additional space at mobile home parks and/or additional development of this type of housing (This might include some speculative development); and

- Areas would be avoided that have severe development constraints such as floodplains and locations under low-level air routes.

The following assumptions were made for rural land use:

- Construction activities on all T/E routes would occur within existing rights-of-way (ROWs) of public entities (state, counties, and cities) and adjoining agricultural land uses would not be physically affected. In those instances where agricultural activities encroach upon the ROWs, impacts resulting from construction activities in the ROWs were not considered.

- Program construction activities could occur at anytime during the year.

The following mitigation measures were assumed for the land use analysis:

- The Air Force will participate in cooperative planning with state and local governmental agencies;

- Fair market value and relocation benefits would be paid, as legally mandated under the provisions of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (Public Law 91-646), to those persons, businesses, and/or institutions required to vacate explosive safety zones (see Section 4.4.1.2);

- Alternate routes shall be provided during road construction prior to construction start;

- The government would pay fair market value for any crops destroyed or taken out of production on private or leased lands as a result of program construction; and

- Disturbed areas shall have erosion control measures implemented.

4.4.2 Impacts of the Proposed Action

This section presents impacts that may potentially occur to the communities of Great Falls (including Malmstrom AFB), Lewistown, and Conrad. In addition, impacts occurring in rural areas of the ROI are included. Overall long-duration impacts associated with the Proposed Action and Housing Option H1 would be low and not significant. The long-duration impacts associated with Housing Option H2 would be moderate and not significant. No short-duration impacts are expected for urban land use (Figure 4.4.2-1). Overall short- and long-duration rural land use impacts would range from negligible to moderate and significant, depending on which launch facilities are selected (Figure 4.4.2-2).

4.4.2.1 Urban Land Use

The impacts to urban land use are expected to be concentrated within the Great Falls urban area. There are no expected urban land use impacts to Lewistown or Conrad. Because the program-related impacts would involve the development of vacant developable land, followed by ongoing human use, the impacts are considered of long duration and are evaluated as such. The impacts associated with the Proposed Action with programmed housing and with Housing Option H1 are rated low and not significant. The impacts associated with Housing Option H2 are rated moderate and not significant.

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible		
Low	o	•
Moderate	O	●
High	◯	⬤
Beneficial Effects	(shaded box)	

Note: Some resource elements may have both beneficial effects and adverse impacts.

LAND USE

ELEMENT/AFFECTED INTEREST	PROGRAM IMPACTS (LOCAL)											
	SHORT DURATION						LONG DURATION					
	PROPOSED ACTION						PROPOSED ACTION					
	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
URBAN LAND USE							o	o	O	o	o	o
GREAT FALLS							o	o	O	o	o	o
LEWISTOWN												
CONRAD												

EM4/4

FIGURE 4.4.2-1 LOCAL IMPACTS TO URBAN LAND USE ASSOCIATED WITH THE PROPOSED SMALL ICBM PROGRAM IN MONTANA

LAND USE

	NUMBER OF LAUNCH FACILITIES													
	SHORT DURATION							LONG DURATION						
	NOT SIGNIFICANT				SIGNIFICANT			NOT SIGNIFICANT				SIGNIFICANT		
ELEMENT	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH
RURAL LAND USE	48	139	13					41	127	12		17	1	2

EM4/5

FIGURE 4.4.2-2 SUMMARY OF SITE IMPACTS TO RURAL LAND USE ASSOCIATED WITH PROPOSED SMALL ICBM CONSTRUCTION AND OPERATIONS AT LAUNCH FACILITIES IN MONTANA

City of Great Falls. The Great Falls urban area would receive the largest amount of population growth associated with the Small ICBM program. The adopted Great Falls City-County Comprehensive Plan has designated 10,516 acres for residential land uses. Approximately 7,331 acres are currently developed, leaving approximately 3,185 acres for future residential growth. The Proposed Action and housing options would require varying amounts of residentially designated vacant developable land in neighborhoods of Great Falls, which is exclusive of the military housing to be built on the expanded portion of the base. The estimated amounts of vacant developable land located outside the base and its expanded area and required for program-related private residential development are:

- Proposed Action - 83 acres;
- Proposed Action with Housing Option H1 - 230 acres; and
- Proposed Action with Housing Option H2 - 375 acres.

For the Proposed Action, a total of 1,746 new housing units are projected to be built on the expanded portion of the base. Because that portion of Malmstrom AFB located west of the runway is essentially built up with existing facilities and because of safety considerations and preservation of the base mission, there is no vacant developable land available onbase for additional housing. The Proposed Action includes the expansion of the base northward to include approximately 330 acres of land for residential purposes. The onbase housing was assumed to be built with a density of 5.3 dwelling units per acre gross. The land is currently vacant and utilized for dry-farmed agriculture. According to the adopted Comprehensive Plan, this land is within the developing urban area of Great Falls. On the north side of the railroad tracks, this land is classified as industrial. If these lands are acquired by the base prior to construction, they would fall within the Malmstrom AFB jurisdiction and would be developed in accordance with their plans. Only 83 acres of vacant developable land under the Great Falls planning jurisdictions would be utilized for residential purposes. The impacts associated with the Proposed Action are therefore considered low and not significant.

Housing Option H1. For this option, 873 new housing units would be located on 165 acres of land within the area identified for the Proposed Action with programmed housing. It is anticipated that 1,380 new housing units would be needed offbase on land designated as residential in the Comprehensive Plan. This would result in a demand being placed upon approximately 230 acres of residentially designated developable land. This demand would reduce the available vacant developable land by about 7 percent and the amount of urbanized residential land use would be expanded by about 3 percent. The impacts associated with Housing Option H1 are considered low and not significant.

Housing Option H2. For this option, there would be no construction of onbase housing. This would result in a demand of 375 acres (approximately 2,250 households) upon the vacant developable land designated as residential in the Comprehensive Plan. This would reduce residential vacant developable land by 12 percent and expand the existing residential land use by 5 percent. The proposed program would be consistent with the adopted Comprehensive Plan. The impact is rated moderate because the program would substantially reduce the supply of vacant developable land. The impact is not expected to be significant since it is consistent with the Comprehensive Plan.

City of Lewistown. The City of Lewistown and adjacent areas of Fergus County contain approximately 2,300 acres of vacant developable land in the Comprehensive Plan for

Lewistown, Montana adopted by the Lewistown City-County Planning Board. The socioeconomic analysis estimates between 20 and 110 new persons would likely become full-time residents of Lewistown and surrounding communities for the duration of construction. An additional 10 persons may be expected to become work-week residents, commuting home on weekends. It is anticipated that the program-related inmigration would be absorbed by existing development in Lewistown.

The proposed program is expected to result in no noticeable change in the rate of urbanization beyond baseline projections. Little or no vacant developable land is anticipated to be utilized. As a result, the impacts are expected to be negligible.

City of Conrad. The City of Conrad and adjacent areas of Pondera County contain 435 acres of vacant developable land planned in the adopted Conrad-Pondera Comprehensive Plan. The socioeconomic analysis estimates between 20 and 60 people may become full-time residents of Conrad during the construction phase. As many as ten additional people may become weekly commuters, commuting home on weekends. It is anticipated that program-related inmigration would be absorbed by existing development in Conrad.

The proposed program is expected to result in no noticeable change in the rate of urbanization beyond baseline projections and little or no vacant developable land would be utilized for new development. As a result, the impacts are expected to be negligible.

4.4.2.2 Rural Land Use

Rural land use impacts are based on an analysis of two subelements: land use affected by construction activities adjacent to the launch facilities, and land use within the expanded explosive safety zones. Overall rural land use impacts could range from negligible to moderate and significant, depending on which launch facilities are used.

Launch Facilities. For the Proposed Action, 100 launch facilities would be used for deployment of two HMLs per site. Each launch facility is inside a fenced area occupying from 1 to 3.3 acres. Each launch facility may be enlarged by approximately 1.6 acres with the existing security fence relocated and extended to enclose the expanded area. During construction activities, another 1.4 acres may be temporarily disturbed at each launch facility. The expansion would include the placement of two earth-covered igloos to house the HMLs and a crew support facility. In addition, some launch facility access roads would be widened to provide for HML movements.

The launch facilities are all located in sparsely populated rural areas. The land use around the launch facilities is dominated by dry-farmed cropland/rangeland, which surrounds 187 launch facilities. Irrigated croplands are present at only five launch facilities. Seven launch facilities are located within forests that are classified as having marketable timber and one launch facility in Lewis and Clark National Forest is located within a year-round off-road vehicle restricted area (motorcycles and snowmobiles are exempted from this restriction).

The overall short and long-duration land use impacts of the Proposed Action are expected to be low and not significant, regardless of the launch facilities selected for HML deployment. There is a strong probability that all of the 100 launch facilities could be selected in a way that only rangeland or dry-farmed cropland would be utilized. Since these land uses are fairly common in the ROI, only a small proportion of these lands would be taken as a result of the program. During the construction phase, a total of

300 acres of land would be disturbed with only 160 acres taken permanently out of agricultural land use. Even if all 13 of the launch facilities which are surrounded by either irrigated croplands or timberlands were utilized, the overall impacts would remain low and not significant. The impacts at individual launch facilities would, however, vary depending upon the land use prevalent around each launch facility and the possibility of its being disturbed.

Explosive Safety Zones. Existing Minuteman explosives safety zones within the Malmstrom AFB ROI consist of a 1,200-foot radius around each launch facility. The proposed program would require the construction of two earth-covered igloos to house the two HMLs in an expanded area of each launch facility selected for deployment. Inhabited structures would be prohibited within a 1,250-foot explosive safety zone from HML shelters. Since the exact direction of the expansion has not been determined, all possible directions were analyzed to include maximum impacts from potential igloo locations. At 180 launch facilities no inhabited structures are located within the expanded explosive safety zones of 1,250 feet. In the optimal case, 100 launch facilities could be chosen from these 180 and no relocation of people would occur. The impacts would then be rated negligible.

Twenty launch facilities with expanded 1,250-foot explosive safety zones contain 38 inhabited residences, 5 commercial structures, and 1 school. If all launch facilities containing occupied structures within the expanded 1,250-foot explosive safety zones were used for the program, overall impacts would be moderate and significant since the Benton Lake Elementary School (9 students) and 43 other inhabited structures within the explosive safety zones, with a combined population of 113 people, would have to be relocated or removed. Launch facilities that have significant rural land use impacts are listed in Table 4.4.2-1.

Deployment Area Roads. Short- and long-duration impacts of the T/E route modifications are rated negligible since the modifications would not adversely affect the adjacent land uses located outside the public ROWs. All disturbance from modification of the T/E routes would occur within these ROWs and therefore would have no impact on land use.

Impedance of Access to Adjoining Land Use. The predominant land use along the T/E routes is dry-farmed cropland and rangeland; irrigated agriculture is also important in a small portion of the deployment area. Agricultural activities along the T/E routes occur in the spring between April 1 and May 15 for planting of spring crops, the summer months for harvest of hay, and from September 15 to October 25 for harvesting of grains and the planting of winter wheat. Livestock, predominantly cattle, are moved periodically during the year for pasture rotation and the road network is utilized to transport livestock to market. Impedance resulting from modification of the T/E routes would have some short-duration, adverse impacts on these seasonal activities in certain localized areas on an intermittent basis. Overall impacts are expected to be low but not significant. The improvement of the roads would be expected to result in long-duration, beneficial impacts.

Hard Mobile Launcher Vehicle Operations Training Area. The HML training facility was assumed to be constructed on the east side of Malmstrom AFB on 600 acres of land currently under Air Force easement near the Weapons Storage Area. The land use consists of dry-farmed cropland devoid of any structures. An abandoned Air Force

Table 4.4.2-1

Launch Facilities With Significant Rural Land Use Impacts
for 1,250, 1,425, and 1,795-Foot Explosive Safety Zones
(For the Proposed Action and Alternatives 1, 2, and 3)

Launch Facility	Proposed Action and Alternative 2 1,250-Foot Explosive Safety Zones				Alternative 1 1,795-Foot Explosive Safety Zones				Alternative 3 1,425-Foot Explosive Safety Zones			
	Number of Occupied Structures[1]				Number of Occupied Structures[1]				Number of Occupied Structures[1]			
	Residences	Other	LOI	Significance	Residences	Other	LOI	Significance	Residences	Other	LOI	Significance
A-6	12	0	High	Significant	17	0	High	Significant	12	0	High	Significant
A-7	0	0	Low	Not Significant	2	0	Low	Significant	1	0	Low	Significant
A-8	2	0	Low	Significant	2	0	Low	Significant	2	0	Low	Significant
A-11	0	0	Low	Not Significant	1	0	Low	Significant	0	0	Low	Not Significant
B-8	0	0	Low	Not Significant	1	0	Low	Significant	1	0	Low	Significant
B-10	0	0	Moderate	Not Significant	4	0	Moderate	Significant	4	0	Moderate	Significant
C-2	0	0	Low	Not Significant	2	0	Low	Significant	2	0	Low	Significant
C-5	0	0	Low	Not Significant	1	0	Low	Significant	0	0	Low	Not Significant
C-8	0	0	Moderate	Not Significant	1	0	Moderate	Significant	0	0	Moderate	Not Significant
C-11	1	1	Low	Significant	4	2	Moderate	Significant	1	1	Low	Significant
D-6	0	0	Low	Not Significant	1	0	Low	Significant	0	0	Low	Not Significant
D-7	0	0	Low	Not Significant	1	0	Low	Significant	0	0	Low	Not Significant
D-8	0	0	Low	Not Significant	1	0	Low	Significant	1	0	Low	Significant
D-9	1	0	Low	Significant	1	0	Low	Significant	1	0	Low	Significant
D-11	2	0	Low	Significant	2	0	Low	Significant	2	0	Low	Significant
E-3	2	0	Low	Significant	2	0	Low	Significant	2	0	Low	Significant
E-9	1	0	Low	Significant	1	0	Low	Significant	1	0	Low	Significant
G-5	1	0	Low	Significant	1	0	Low	Significant	1	0	Low	Significant
H-4	0	0	Moderate	Not Significant	4	0	Moderate	Significant	3	0	Moderate	Significant
H-5	1	0	Low	Significant	1	0	Low	Significant	1	0	Low	Significant
H-6	1	0	Low	Significant	1	0	Low	Significant	1	0	Low	Significant
H-9	0	0	Moderate	Not Significant	1	0	Moderate	Significant	0	0	Moderate	Not Significant
I-10	1	0	Low	Significant	2	0	Low	Significant	1	0	Low	Significant
J-6	0	1	High	Significant	1	1	High	Significant	0	1	High	Significant
J-10	4	0	Low	Significant	4	0	Low	Significant	4	0	Low	Significant
K-5	0	0	Low	Not Significant	1	0	Low	Significant	0	0	Low	Not Significant
M-2	1	0	Low	Significant	4	0	Low	Significant	3	0	Low	Significant
M-5	1	1	Low	Significant	4	2	Moderate	Significant	3	2	Moderate	Significant
M-7	3	3	Moderate	Significant	3	3	Moderate	Significant	3	3	Moderate	Significant
N-2	1	0	Low	Significant	1	0	Low	Significant	1	0	Low	Significant
N-3	0	0	Low	Not Significant	2	0	Low	Significant	1	0	Low	Significant
N-8	1	0	Low	Significant	1	0	Low	Significant	1	0	Low	Significant
N-9	0	0	Negligible		1	1	Low	Significant	0	0	Low	Not Significant
P-6	0	0	Low	Not Significant	1	0	Low	Significant	0	0	Low	Not Significant
Q-15	1	0	Low	Significant	1	0	Low	Significant	1	0	Low	Significant
S-33	1	0	Low	Significant	1	0	Low	Significant	1	0	Low	Significant
S-34	0	0	Low	Not Significant	1	0	Low	Significant	1	0	Low	Significant
T-42	0	0	Low	Not Significant	1	0	Low	Significant	0	0	Low	Not Significant
T-43	0	0	Low	Not Significant	0	1	Low	Significant	0	0	Low	Not Significant
T-44	0	0	Low	Not Significant	1	0	Low	Significant	0	0	Low	Not Significant
TOTALS:	38	6			82	10			56	7		

Notes: [1]Actual number of occupied structures may change during the final siting process; others include commercial buildings and one school.

building located adjacent to the HML training facility is the only structure in the vicinity. The adopted Comprehensive Plan of the Great Falls City-County Planning Board has not given the land any specific land use designation. The Proposed Action would result in the elimination of 600 acres of dry-farmed agriculture.

Since the Proposed Action would permanently eliminate 600 acres of dry-farmed cropland, the long-duration impacts are rated low and not significant as the total cropland removed amounts to less than 1 percent of the total dry-farmed acreage of Cascade County.

4.4.3 Impacts of Alternatives

Like the Proposed Action, impacts to urban land use for all three alternatives are rated low and not significant. Since urban land use would not change in the cities of Lewistown and Conrad, only the City of Great Falls is discussed.

For overall rural land use, Alternative 2 has essentially the same overall range of impacts as the Proposed Action (negligible to moderate and significant). The impacts of Alternative 1 could range from negligible to high and significant, and Alternative 3 is expected to have overall rural land use impacts that are moderate and significant.

4.4.3.1 Urban Land Use

Approximately 3,185 acres are designated for future residential growth in the Great Falls City-County Comprehensive Plan. The estimated amounts of vacant developable land located outside the base and its expanded area required for the alternatives are:

- Alternative 1 - 72 acres;
- Alternative 2 - 93 acres; and
- Alternative 3 - 83 acres.

Alternative 1. For Alternative 1, a total of 1,230 new housing units are proposed to be built onbase. Total offbase housing would be approximately 430 units. This alternative would site onbase military housing at the same location as the Proposed Action; however, only 230 acres would be utilized, which is a reduction of 100 acres from the Proposed Action. The amount of offbase nonmilitary housing would occupy approximately 72 acres, which is a reduction of 11 acres from the Proposed Action. The difference in acres consumed between the Proposed Action and this alternative is minor; therefore, the LOI and significance ratings are the same as for the Proposed Action (long-duration, low, and not significant impacts).

Alternative 2. For Alternative 2, a total of 2,000 new housing units are proposed to be built onbase. This alternative would site onbase military housing at the same location as the Proposed Action; however, 380 acres would be utilized, which is an increase of 50 acres over the Proposed Action. The additional acres are required because 254 more housing units would be developed for this alternative. The amount of land devoted to offbase nonmilitary housing would be approximately 93 acres, an increase of 10 acres over the Proposed Action, because 60 more dwelling units would be required. The difference in developed acres between the Proposed Action and this alternative is minor; therefore, the LOI and significance ratings would remain the same as for the Proposed Action (low and not significant).

Alternative 3. Alternative 3 would require 330 acres of land for 1,746 new housing units to be built onbase, which is identical to the Proposed Action. The amount of land devoted to offbase nonmilitary housing is 83 acres, which is also identical to the Proposed Action. The LOI and significance ratings would remain the same as the Proposed Action (low and not significant).

4.4.3.2 Rural Land Use

Alternative 1. Alternative 1 would require the construction of a pre-engineered building designed to house two HMLs. The use of a pre-engineered building would require an explosive safety zone of 1,795 feet. Therefore, for analysis purposes, the explosive safety zone includes a study area of 1,900 feet to include the pre-engineered building site and the 1,795-foot explosive safety zone.

At 160 launch facilities, no occupied structures are located within the explosive safety zones. There are 92 inhabited structures (including 1 school) located within the explosive safety zones of 40 launch facilities. In the optimal case (where 100 launch facilities are chosen and are sited in uninhabited areas), the impacts would be negligible as in the Proposed Action. However, if all 40 launch facilities that contain inhabited structures within the explosive safety zones are to be used by the program, the impact would be rated high and significant because there would be more than 50 inhabited structures that would have to be relocated. Launch facilities that have significant rural land use impacts are listed in Table 4.4.2-1.

Alternative 2. Alternative 2 would utilize 125 launch facilities and deploy two HMLs per site. The launch facility improvements are the same as the Proposed Action, the only difference being the addition of 25 additional launch facilities.

The optimal-case impact would be the same as Proposed Action; that is, negligible. The worst-case impact to irrigated lands, forested areas, and rangeland would be the same as the Proposed Action. The only difference would be the short-duration loss of 75 additional acres of dry-farmed cropland and the long-duration loss of 30 acres. The short-duration impacts of the loss of a total of 375 acres would still be low and not significant and the long-duration loss of 200 acres would still be rated negligible.

The range of impacts resulting from expanded 1,250-foot explosive safety zones is the same as for the Proposed Action (Table 4.4.2-1).

Alternative 3. Alternative 3 would utilize all 200 launch facilities and deploy one HML in a pre-engineered building per site with an explosive safety zone of 1,425 feet. Overall impacts to agricultural uses would be identical to the Proposed Action, though land taken at individual launch facilities would be somewhat less than the Proposed Action since less land is required to deploy one HML per site. Since the proposed program would use all 200 launch facilities, the 28 launch facilities with structures in the expanded 1,425-foot explosive safety zones would be required. Therefore, overall impacts are rated high and significant because 63 inhabited structures would have to be relocated. Launch facilities with significant rural land use impacts are listed in Table 4.4.2-1.

4.4.4 Cumulative Impacts

4.4.4.1 Urban Land Use

Peacekeeper in Rail Garrison activity would be concentrated at Malmstrom AFB and vicinity. Urban land use impacts are therefore analyzed for the Great Falls urban area.

The concurrent deployment of Small ICBM and Peacekeeper in Rail Garrison programs would use 453 acres of land located within the Great Falls City-County Planning Area and outside of Malmstrom AFB. Approximately 360 acres of privately owned land is anticipated to be acquired by the Air Force for base expansion to accommodate new base housing for both Small ICBM and Peacekeeper in Rail Garrison basing. Elsewhere in the City-County Planning Area another 93 acres would be used for offbase housing on lands designated as residential in the adopted Comprehensive Plan. The difference in privately developed acres between the Proposed Action and this cumulative action is only 10 acres. The impacts are therefore, rated low. Impacts would not be significant since there would be no inconsistency with the Comprehensive Plan.

4.4.4.2 Rural Land Use

The Peacekeeper in Rail Garrison program is not expected to affect rural land use.

4.4.5 Impacts of the No Action Alternative

Under the No Action Alternative, the Air Force will continue to maintain existing Minuteman ICBMs. The scope of such activities will not cause changes in either the urban or rural areas. In the urban areas of Great Falls, Lewistown, and Conrad, land use changes will occur as a result of normal growth of these communities. The growth of these communities is expected to be very modest. For rural land use, it is expected that the current land uses will continue. There will probably be some decrease in dry-farmed cropland acreage due to the encouragement of the Federal Farm Program to retire the erodible and/or unproductive lands from cultivation, whereby the land eventually will revert to rangeland or timber. However, the character of the ROI is not expected to change from its present appearance.

4.4.6 Potential Mitigation Measures

Potential mitigations are measures that could be undertaken to reduce or eliminate program impacts. The Air Force would encourage implementation of such measures through environmental awareness and other programs. Potential mitigation measures for land use include reviewing the comprehensive plan to make necessary changes in zoning and subdivision regulations. This could be effective in encouraging infill and orderly growth and reducing leap-frog development. This measure should be implemented as development applications are processed. The City of Great Falls and the Great Falls City-County Planning Board would be involved in implementation of this measure.

4.4.7 Irreversible and Irretrievable Resource Commitments

For urban land use, use of land for expansion of housing can be considered resource commitments for the life of the residential buildings. Such a use would not cause an irretrievable commitment as land can be retrieved through demolition of homes.

For rural land use, removal of 760 acres of mixed irrigated croplands, dry-farmed croplands, forests, and rangelands together with the removal of occupied structures within the explosive safety zones of the launch facilities would result in commitment to new land use for the life of the program. This would not be considered an irreversible or irretrievable commitment of land.

4.4.8 Relationship Between the Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Development of vacant developable lands could occur sooner than might otherwise occur, but it would enhance the long-term productivity of the land as a community resource.

Agricultural losses at the launch facilities and HML vehicle operations training area may limit the production of forage, hay, and timber on a small scale. The provisions of the Federal Farm Programs of the U.S. Department of Agriculture would appear to prevent the actual loss of production of grains (wheat, barley, oats, and corn). In instances of actual loss to operators, the loss would be compensated. With regard to inhabited structures, fair market value and relocation benefits will be paid, as legally mandated, to those persons, businesses, and/or institutions required to vacate explosive safety zones.

4.5 Recreation

Construction and operations personnel and their dependents would use local recreation facilities in Great Falls and resource-based recreation areas in the north-central Montana region. Program-related impacts to both regional and local recreation have been evaluated in this analysis.

4.5.1 Impact Analysis Methodology

The impact analysis methodology for recreation involved three separate procedures: evaluation of program impacts, determination of levels of impact (LOI), and determination of the significance of impacts. The methodology also included consideration of a number of assumptions and assumed mitigations. Impacts were evaluated at the local and regional levels and an overall collective assessment was made for local recreation.

4.5.1.1 Evaluation of Program Impacts

Regional Recreation. Regional recreation areas could be affected by increased recreation use resulting from program-induced populations. Increased use, particularly during seasonal and holiday weekends, could reduce the quality of the recreational experience and create unsafe and unhealthful conditions when use exceeds the carrying capacity of such areas. The baseline analysis identified recreation areas within approximately 150 travel miles of Great Falls (Section 3.5.3, Figure 3.5.3-1) and projected use for various recreation activities at these areas.

Potential impacts to regional recreation areas were determined by evaluating increased recreation use for various activities in terms of the ability of the areas to absorb increases in use without a decrease in the quality of the recreational experience. The methodology to determine the increase in recreation demand resulting from program-induced population growth involved two basic steps: calculating total induced recreation participation by activity for the region and allocation of the demand by activity to individual recreation areas within the Region of Influence (ROI). Increased recreation use was calculated using per capita participation rates for each activity from a 1985 outdoor recreation needs survey conducted for the Montana Department of Fish, Wildlife and Parks.

Program-related population growth would begin in 1990 and will continue to increase until 1996 or 1997, when it would decrease slightly and then level off. Two forecast years were selected for analysis: the peak-population year and the steady-state year. The peak-population year represents the year (1996 for the Proposed Action, Alternative 1, and Alternative 3, and 1997 for Alternative 2) when program-related population would be highest, and the steady-state year represents the year (year 2000) when inmigrant population would level off after construction and assembly and checkout activities are completed.

The increased demand for recreation attributed to program-related population growth was estimated by multiplying the forecasted peak-year and steady-state year population levels by the various participation rates. The total induced demand for each activity was then allocated to specific recreation areas based on historic use data, discussions with regional recreation officials, and professional judgment. Total induced demand for each activity was adjusted downward by approximately 5 percent to account for participation in recreation activities by the program-induced population outside of the ROI.

Because historic use data for many recreation areas in the ROI were unavailable or consisted of estimates of total annual usage (i.e., did not include breakdown of use by activity), discussions with regional recreation officials and professional judgment were primarily used to assess the potential impacts on regional recreation areas. Impacts were based on the overall assessment of increased use at each recreation area and the ability of each area to absorb the increased use.

Local Recreation. The components of the local park and recreation systems in the affected communities were analyzed using the methodology discussed in Section 3.5.2.3. In general, inmigrant populations in the peak-population year and the steady-state year were added to the projected population for those years to determine demand for parkland and facilities with the program-induced population. Based on program-induced population projections, the peak-population year for Great Falls would be 1996 for the Proposed Action, Alternative 1, and Alternative 3, and 1997 for Alternative 2. The peak-population year for Lewistown and Conrad would be 1992 and 1993, respectively, for the Proposed Action, Alternative 1, and Alternative 3; for Alternative 2, the peak-population year for Lewistown and Conrad would be 1994 and 1993, respectively. The steady-state year would occur in the year 2000 for Great Falls and 1996 for Lewistown and Conrad.

Per capita facility and parkland acreage ratios with the program-induced population were then determined and compared to existing ratios to determine the impact of the program on local recreation. Existing ratios were based on an estimated 1986 population of approximately 70,300 for the Great Falls urban area, 58,400 for the City of Great Falls, 6,900 for Lewistown, and 3,100 for Conrad. Impacts were assessed on the need for additional parkland acreage and recreation facilities to maintain baseline ratios.

4.5.1.2 Determination of Levels of Impact

Regional Recreation. The LOIs for regional recreation are based on increases in visitation at recreation areas within the ROI. Changes in visitation pressure are associated with program-related increases in population and the relative ability of recreation areas to absorb increases in recreation use. Although recreation opportunities are available year-round, recreation use tends to be concentrated at specific times of the year depending on the activity. These peak-use periods, generally holidays and seasonal weekends (e.g., summer, winter, or activity-specific such as hunting), typically account for a majority of the use. Problems such as overcrowding, activity conflicts, traffic congestion, littering, loss of serenity, and law enforcement are all linked to increases in visitation and can result in declines in the perceived quality of the recreational experience and potential health and safety problems.

The extent that increased visitation would decrease the quality of the recreational experience determines the changes in the operation and management of recreation areas (e.g., upgrading/expansion of facilities or restricting access through use of permits or reservation requirements) required to maintain existing recreational qualities.

The LOIs for regional recreation are the following:

- Negligible Impact -- No increase in visitation, or increased visitation pressure that recreation areas within the ROI would be able to absorb without a decline in the perceived quality of the recreational experience.

- Low Impact -- Increased visitation pressure may result in occasional crowding of recreation areas and a slight decline in the perceived quality of the recreational experience. Increased recreation use would contribute to the crowding of recreation areas during peak-use periods.

- Moderate Impact -- Increased visitation pressure may result in frequent crowding of recreation areas and a noticeable decline in the perceived quality of the recreational experience. Increased recreation use would contribute to the crowding of recreation areas during both peak-use and some nonpeak-use periods.

- High Impact -- Increased visitation pressure may result in regular crowding of recreation areas and a substantial decline in the perceived quality of the recreational experience.

Local Recreation. The LOIs for local recreation are defined in terms of the decline in the level of service provided by the existing recreation system (i.e., facilities, programs, staffing, and parkland) resulting from an increase in the demand for local recreation services. The extent that the capacity of the existing system is exceeded determines the expansion of the system (e.g., additional parkland, facilities, staffing, and/or programs) required to maintain existing levels of service. Capacity was evaluated in terms of the ability of the local system to maintain a balanced neighborhood distribution of parkland and facilities in the community and provide recreation services without limiting or restricting use of facilities or placing limitations on participation in recreation programs. The LOIs for local recreation are the following:

- Negligible Impact -- No increase in demand for recreation services, or an increase in demand would occur that would not exceed the existing capacity; no decline in the level of service provided.

- Low Impact -- An increased demand for recreation services would approach the capacity of the existing system with a slight decline in the level of service provided. No parkland or facility deficiencies would occur.

- Moderate Impact -- An increased demand for recreation services would exceed the capacity of the existing system with a noticeable decline in the level of service provided; minor parkland and facility deficiencies would occur.

- High Impact -- An increased demand for recreation services would exceed the capacity of the existing system with a substantial decline in the level of service provided; major parkland and facility deficiencies would occur.

4.5.1.3 Determination of Significance

The significance of recreation impacts were evaluated in accordance with Council on Environmental Quality (CEQ) regulations. Significance was assessed through evaluation of the context and intensity of the impacts. Context includes consideration of the settings (site, local, or regional) and the duration of the impacts. The CEQ regulations provide ten items that should be considered in evaluating intensity. Of these ten items, the following are applicable to the recreation resource:

- Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas;

- The degree to which the effects on the quality of the human environment are likely to be highly controversial; and

- The degree to which the proposed action affects public health or safety.

Public health and safety may be affected if increased use of recreation areas results in overcrowded conditions and delays or reductions in the maintenance of facilities that may create unsafe conditions and increase the potential for injury.

In addition to these considerations, which are specifically identified in the CEQ regulations, the following consideration is judged appropriate for the recreation resource:

- Whether the action creates a need for institutional responses in the form of capital expenditures for the development of new facilities.

Should recreation opportunities become exhausted, the need to provide new recreation lands or facilities may require extensive institutional response such as raising taxes or floating a bond issue.

4.5.1.4 Assumptions and Assumed Mitigations

The following assumptions were applied in assessing impacts to regional recreation:

- An ROI based on a 150-mile travel distance (i.e., approximately 3 hours) from the potentially affected population center would capture most of the regional recreation demand generated by the program-induced population;

- Regional recreation demand in the ROI would increase at a rate proportional to population growth;

- Program-induced population would participate in various recreation activities with the same frequency as current residents of the region; and

- Ninety-five percent of the total program-induced demand for most activities would occur at regional recreation areas within the ROI.

No mitigation measures were assumed for the regional recreation analysis.

The following assumption was applied in assessing impacts to local recreation:

- Existing parkland, recreation facilities, recreation programs, and staffing levels are adequate to provide a balanced recreation system, given current budgetary constraints.

No mitigation measures were assumed for the local recreation analysis.

4.5.2 Impacts of the Proposed Action

Long-duration impacts on regional recreation for the Proposed Action would be low and not significant because increased recreation use would contribute to the crowding of some recreation areas during peak-use periods, resulting in a slight decline in the quality of the recreational experience. Long-duration impacts to local recreation for the Proposed Action would be moderate and significant because program-induced demand for recreation facilities and programs may result in or contribute to facility shortages, resulting in a noticeable decline in the level of service provided (Figure 4.5.2-1).

4.5.2.1 Regional Recreation

Increased recreation use in the ROI would result in long-duration, low, and not significant impacts to regional recreation. Since program-related population growth would begin in 1990, continue to increase until 1997, and remain at essentially that level during the operations phase, long-duration impacts would occur to regional recreation. Impacts would be low because overall use at most recreation areas in the ROI is generally high only during peak-use periods. Increased use would contribute to the crowding of some recreation areas during these periods, resulting in a slight decline in the quality of the recreational experience. Impacts are not considered significant since infrequent crowding of some recreation areas would not require a major institutional response to provide additional facilities. Impacts would be the same regardless of the housing option selected.

Program-induced population growth is projected to increase total recreation use in the ROI by approximately 4 percent above baseline projections by 1996, and decline to 3.6 percent by the year 2000. The projected increase in use for various activities is shown in Table 4.5.2-1. However, the relative increase in use at some individual recreation areas for various activities would be greater, since recreation use is not evenly distributed throughout the ROI.

Within the ROI, the largest increase in recreation use would occur in the Lewis and Clark National Forest, primarily the Jefferson Division in the Little Belt, Snowy, and Highwood mountains. It is projected that a majority of the total increased recreation use in the national forest would occur in the Jefferson Division because of its proximity to Great Falls. Activities expected to receive the largest increase in use include fishing (increase of 1,400 activity days), hunting (7,600 activity days), downhill skiing (4,100 activity days), cross-country skiing (1,100 activity days), camping (3,500 activity days), off-road vehicle (ORV) use (2,950 activity days), and snowmobiling (3,850 activity days). The increase in use above baseline totals for this recreation area is projected to be 5 to 9 percent for each of these activities. The increase in use above baseline totals for other activities is projected to be 4 percent or less.

Increases in recreation use for the Jefferson Division would have a low and not significant impact on regional recreation. The increased use that is expected to occur may result in a slight decline in the quality of the recreational experience. The Jefferson Division is heavily used for certain activities such as hunting and camping, and increasingly for snowmobiling, ORV use, and cross-country skiing. Much of the increased use can be expected to occur during periods when use of the national forest is at its highest for these activities (i.e., holiday weekends, hunting season, or winter sports season).

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible		
Low	○	●
Moderate	○	●
High	○	●
Beneficial Effects		

Note: Some resource elements may have both beneficial effects and adverse impacts.

RECREATION

ELEMENT/AFFECTED INTEREST	PROGRAM IMPACTS											
	SHORT DURATION						LONG DURATION					
	PROPOSED ACTION						PROPOSED ACTION					
	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
REGIONAL RECREATION							○	○	○	○	○	○
LOCAL RECREATION							●	●	●	●	●	●
GREAT FALLS							●	●	●	●	●	●
LEWISTOWN												
CONRAD												

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FIGURE 4.5.2-1 IMPACTS TO REGIONAL AND LOCAL RECREATION ASSOCIATED WITH THE PROPOSED SMALL ICBM PROGRAM IN MONTANA

Table 4.5.2-1

Estimated Recreation Use in the Region of Influence
(In Activity Days[1])

Activity	Percent Participation[2]	Median Days[3]	Baseline 1996[4]	Baseline 2000[4]	Proposed Action 1996[5]	Proposed Action 2000[5]
Camping	54.5	8	620,400	634,400	645,300	657,500
Hunting	36.8	10	523,700	535,400	544,700	554,900
Backpacking	12.3	6	105,000	107,400	109,200	111,300
Horseback Riding	20.6	6	175,900	179,800	182,900	186,400
ORV Use (4x4)	19.0	7	189,300	193,500	196,800	200,600
ORV Use (All-Terrain Vehicles)	11.9	10	169,300	173,100	176,100	179,500
Picnicking	77.1	6	658,300	673,100	684,600	697,600
Fishing	57.3	12	978,500	1,000,500	1,017,600	1,036,900
Motorboating	33.6	5	239,100	244,400	248,600	253,300
Waterskiing	16.2	4	92,200	94,300	95,900	97,700
Swimming[6]	43.1	7	429,300	439,000	446,500	455,000
Rafting	14.6	3	62,300	63,700	64,800	66,000
Canoeing	11.4	4	64,900	66,300	67,500	68,100
Snowmobiling	19.0	5	135,200	138,200	140,600	143,300
Cross-Country Skiing	12.3	7	122,600	125,300	127,400	129,800
Downhill Skiing	17.8	6	152,000	155,400	158,100	161,100

Notes:
[1] Based on participation rates for Montana Department of Fish, Wildlife and Parks Administrative Region 4 (Cascade, Chouteau, Fergus, Glacier, Judith Basin, Lewis and Clark, Liberty, Meagher, Petroleum, Pondera, Teton, and Toole counties) from the Montana Outdoor Recreation Needs Survey (University of Montana, School of Forestry 1986).
[2] Percent of population 18 years or older estimated to participate in activity at least once during the year.
[3] Median number of days participation in activity occurs.
[4] Total annual participation in activity days based on an estimated population (18 years or older) of approximately 142,300 for 1996 and 145,500 for the year 2000 in Region 4.
[5] Total annual participation in activity days based on an estimated population (18 years or older) of approximately 148,000 for 1996 and 150,800 for the year 2000 in Region 4 (project-induced populations of 5,700 and 5,300, respectively).
[6] Swimming in lakes, streams, rivers, or ponds.

The Rocky Mountain Division of the Lewis and Clark National Forest is also expected to receive a large increase in recreation use, particularly in the Gibson Reservoir and Teton River Headwaters areas. Activities expected to receive the largest increased use include fishing (3,100 activity days), hunting (3,800 activity days), backpacking (2,200 activity days), camping (1,700 activity days), horseback riding (3,300 activity days), snowmobiling (900 activity days), and boating (500 activity days). The increase in use above baseline for each of these activities is projected to be 4 to 8 percent. The increase in use for other activities above baseline totals is projected to be 3 percent or less. Impacts are projected to be low and not significant for the Rocky Mountain Division because this area is also heavily used for certain activities during peak-use periods, and increased use may contribute to existing crowded conditions at these times, resulting in a slight decline in the quality of the recreational experience.

Holter and Canyon Ferry lakes are projected to receive increased boating and waterskiing use. Increases in boating (2,800 and 900 activity days, respectively) and waterskiing (900 and 400 activity days, respectively) activities are expected to result in a 5-percent or less increase in use above baseline totals. Camping would also increase at these lakes, as would fishing and swimming. The lakes are very popular recreation areas, particularly for water-based activities, and are generally crowded on most summer and holiday weekends. Increased use during the peak-use periods would result in low and not significant impacts at these areas.

Picnicking and general day-use activities would increase at Giant Springs State Park, near Great Falls. The park is heavily used by both residents of Great Falls (including Malmstrom Air Force Base [AFB] personnel) and by visitors from outside the Great Falls region. The demand for use of the group picnic area and other areas of the park is expected to increase by approximately 8 percent above baseline as a result of program-induced population growth. Heaviest use of the park occurs during the summer months, but weather permitting, use by Great Falls' residents occurs year-round. Increased use of the park during the peak-use periods would result in low and not significant impacts at the park.

State recreation areas along the Missouri River and fishing access sites at various lakes (particularly Ackley Lake, Eureka Reservoir, Newlan Creek Reservoir, Pishkun Reservoir, and Willow Creek Reservoir) in the ROI would receive increased recreation use, primarily for fishing (100 to 1,500 activity days). It is projected that fishing use would increase from 4 to 7 percent above baseline at these recreation areas. Boating would also increase, as well as camping and waterskiing at some of these areas. Many of these areas receive heavy use on holiday and summer weekends, and increased use may contribute to a slight decline in the quality of the recreational experience, resulting in low and not significant impacts.

Benton Lake National Wildlife Refuge and Freezeout Lake Wildlife Management Area are projected to receive increased use (300 and 800 activity days, respectively) for hunting, primarily migratory and small game-bird hunting. Increased use is projected to be 5 percent or less, but would be concentrated at times of the year when these areas are already heavily used (i.e., hunting season), resulting in low and not significant impacts at these areas.

The Smith and Missouri rivers are expected to receive most of the floating activity in the ROI. It is projected that each river would receive less than 700 activity days of increased use. Impacts would be low and not significant because increased use would most likely occur during summer months when floating activity is highest, and would

contribute to a slight decline in the perceived quality of the recreational experience. The relative increase in use above baseline totals at other recreation areas in the ROI is projected to be 3 percent or less, resulting in low and not significant or negligible impacts at these areas.

4.5.2.2 Local Recreation

Long-duration impacts to local recreation for the Proposed Action would be moderate and significant for the City of Great Falls, and negligible for the cities of Lewistown and Conrad. Overall impacts to local recreation are based upon the impacts determined for the City of Great Falls. Long-duration impacts for Great Falls would be moderate and significant because program-induced demand for recreation facilities and programs may result in or contribute to facility shortages, resulting in a noticeable decline in the level of service provided. Impacts for Lewistown and Conrad would be negligible because existing facilities and programs are adequate to accommodate the program-induced demand for recreation services.

City of Great Falls. Irrespective of whether most of the permanent population growth occurs at Malmstrom AFB (i.e., Proposed Action with programmed housing) or in the community (i.e., Housing Option H2 with no programmed housing), the additional use of recreation facilities and programs provided in Great Falls and additional parkland requirements would result in moderate and significant impacts on local recreation, unless the recreation system is expanded to meet program-induced demands (Table 4.5.2-1). Long-duration impacts would occur because the recreation demand identified during the peak year would essentially remain at the same level throughout the operations phase.

Program-related population growth in the Great Falls urban area is projected to result in a 10.9-percent (8,120 inmigrants) increase in population above baseline projections by 1996, declining to 10.1 percent (7,560 inmigrants) by the year 2000. Great Falls' parkland and recreation facilities would receive increased pressure from the inmigrant population. To maintain existing per capita ratios for recreation facilities, additional softball (2 fields), golf (9 holes), tennis (5 courts), and swimming (1 pool) facilities would be needed in the peak-population year (1996). Local recreation impacts would occur because certain facility shortages, in particular, softball and golf, may exist in the local recreation system and the program-related population growth would increase demand for these facilities. These baseline facility shortages would be exacerbated resulting in a noticeable decline in the level of service provided by the recreation system unless additional facilities are provided. The need for additional tennis and swimming facilities may be reduced or eliminated depending upon the location of new housing in the community. If new housing is built in areas of the city currently having limited residential development and therefore few or no neighborhood recreation facilities, additional facilities would be required as a result of the program-induced growth. Impacts would be significant because the development of additional facilities would require extensive institutional response in the form of capital expenditures for construction of these facilities.

To maintain existing per capita ratios for developed parkland, approximately 110 acres of additional parkland would be needed to provide new facilities (80 to 90 acres) and for development of new neighborhood parks (20 to 30 acres). Development of new facilities would likely occur on undeveloped parcels already owned by the city. New neighborhood parks may be needed depending upon the housing option selected. For Housing Option H2 (no programmed housing), most of the population growth would occur in the community. Because those areas of Great Falls projected to receive a majority of the new housing

development (e.g., the area west of Malmstrom AFB and east of the city's corporate limits and the area south of 10th Avenue South and east of the Missouri River) currently have only a small amount of parkland acreage because of limited residential development, additional parkland would need to be developed to meet specific neighborhood needs. Land would generally be acquired through land dedication when new subdivisions are built, but development would still be necessary. New neighborhood park requirements would be less for Housing Option H1 and no new neighborhood parks would be required for the Proposed Action with programmed housing. Impacts on parkland for Housing Options H1 and H2 would be moderate because there would be a noticeable decline in the level of service provided by the recreation system without the development of additional neighborhood parks. Impacts would be significant because a fiscal response would be required to develop such parkland. Parkland impacts for the Proposed Action with programmed housing would be negligible.

Cities of Lewistown and Conrad. Construction-phase activities near Lewistown and Conrad would produce modest population increases for a short period of time. Population increases in Lewistown are forecast to occur over a 5-year period, peaking in 1992 with 110 continuous and 10 commuting inmigrants. Increases in Conrad are also forecast to occur over a 5-year period, peaking in 1993 with 60 continuous and 10 commuting inmigrants. Program-related population increases would not create a demand for additional parkland, facilities, and staffing beyond that already provided for within the communities. The available facilities and parkland acreage for both Lewistown and Conrad (Section 3.5.3.2) are adequate to accommodate the program-induced demand for recreation services. Program impacts are therefore considered to be negligible in both of these communities.

4.5.3 Impacts of Alternatives

Long-duration impacts to regional recreation for Alternatives 1, 2, and 3 would be low and not significant because increased recreation use would contribute to the crowding of some recreation areas during peak-use periods, resulting in a slight decline in the quality of the recreational experience. Long-duration impacts to local recreation for all three alternatives would be moderate and significant because program-induced demand for recreation facilities and programs may result in or contribute to facility shortages, resulting in a noticeable decline in the level of service provided.

4.5.3.1 Regional Recreation

Alternative 1. Program-induced population growth for Alternative 1 is projected to increase total recreation use in the ROI by approximately 2.9 percent above baseline totals by 1996 and 2.5 percent by the year 2000. As a result of the smaller population growth for Alternative 1, program-induced recreation use in the ROI would be approximately 30 percent lower for Alternative 1 than for the Proposed Action (Table 4.5.2-2). Therefore, increased use at individual recreation areas would be lower, specifically in the Lewis and Clark National Forest and at other heavily used recreation areas in the ROI. However, impacts to regional recreation would remain low and not significant, though the smaller increase in use would reduce the potential for a decline in the quality of the recreational experience at these areas.

Alternative 2. Program-induced population growth for Alternative 2 is projected to increase total recreation use in the ROI by approximately 4.8 percent above baseline totals by 1997 and 4.5 percent by the year 2000. As a result of the larger population growth for Alternative 2, program-induced recreation use in the ROI would be

Table 4.5.2-2

Estimated Program-Induced Recreation Use
in the Region of Influence for the Proposed Action and Alternatives
(In Activity Days[1])

Activity	Percent Participation[2]	Median Days[3]	Proposed Action 1996[4]	Proposed Action 2000[4]	Alternatives 1 & 3 1996[4]	Alternatives 1 & 3 2000[4]	Alternative 2 1997[4]	Alternative 2 2000[4]	Cumulative 1996[4]	Cumulative 2000[4]
Camping	54.5	8	24,800	23,100	17,900	16,100	29,700	28,300	27,000	25,300
Hunting	36.8	10	21,000	19,500	15,100	13,600	25,000	23,900	22,800	21,300
Backpacking	12.3	6	4,200	3,900	3,000	2,700	5,000	4,800	4,600	4,300
Horseback Riding	20.6	6	7,000	6,600	5,100	4,600	8,400	8,000	7,700	7,200
ORV Use (4x4)	19.0	7	7,600	7,000	5,500	4,900	9,000	8,600	8,200	7,700
ORV Use (All-Terrain Vehicles)	11.9	10	6,800	6,300	4,900	4,400	8,100	7,700	7,400	6,900
Picnicking	77.1	6	26,300	24,500	19,000	17,100	31,500	30,100	28,700	26,800
Fishing	57.3	12	39,200	36,400	28,200	25,400	46,800	44,700	42,600	39,900
Motorboating	33.6	5	9,600	8,900	6,900	6,200	11,400	10,900	10,400	9,700
Waterskiing	16.2	4	3,700	3,400	2,700	2,400	4,400	4,200	4,000	3,800
Swimming[5]	43.1	7	17,200	16,000	12,400	11,200	20,500	19,600	18,700	17,500
Rafting	14.6	3	2,500	2,300	1,800	1,600	3,000	2,800	2,700	2,500
Canoeing	11.4	4	2,600	2,400	1,900	1,700	3,100	3,000	2,800	2,600
Snowmobiling	19.0	5	5,400	5,000	3,900	3,500	6,500	6,200	5,900	5,500
Cross-Country Skiing	12.3	7	4,900	4,600	3,500	3,200	5,900	5,600	5,300	5,000
Downhill Skiing	17.8	6	6,100	5,700	4,400	4,000	7,300	6,900	6,600	6,200

Notes: [1]Based on participation rates for Montana Department of Fish, Wildlife and Parks Administrative Region 4 (Cascade, Chouteau, Fergus, Glacier, Judith Basin, Lewis and Clark, Liberty, Meagher, Petroleum, Pondera, Teton, and Toole counties) from the Montana Outdoor Recreation Needs Survey (University of Montana, School of Forestry 1986).

[2]Percent of population 18 years or older estimated to participate in activity at least once during the year.

[3]Median number of days participation in activity occurs.

[4]Total annual participation in activity days based on an estimated population (18 years or older) of approximately 5,700 for 1996 and 5,300 for the year 2000 for the Proposed Action; 4,100 (1996) and 3,700 (year 2000) for Alternatives 1 and 3; 6,800 (1997) and 6,500 (year 2000) for Alternative 2; and 6,200 (1996) and 5,800 (year 2000) for the Proposed Action with the Peacekeeper in Rail Garrison program.

[5]Swimming in lakes, streams, rivers, or ponds.

approximately 19 percent higher for Alternative 2 than for the Proposed Action in the peak year and 23 percent higher in the steady-state year (Table 4.5.2-2). However, even though the increased use at individual recreation areas would be higher, impacts would remain low and not significant as for the Proposed Action.

Alternative 3. Impacts of Alternative 3 would be the same as for the Proposed Action.

4.5.3.2 Local Recreation

Alternative 1. Program-related population growth in the Great Falls urban area would result in an approximate 7.9-percent increase (5,890 inmigrants) above baseline totals by 1996 declining to a 7.1-percent increase (5,360 inmigrants) by the year 2000. Impacts of Alternative 1 would be the same as those of the Proposed Action with programmed housing. Facility requirements necessary to maintain existing per capita ratios would be similar, resulting in a moderate and significant impact. New neighborhood parks would not be needed because most population growth would occur at Malmstrom AFB. Program-induced population growth in Lewistown and Conrad would be similar to the Proposed Action, and therefore, impacts to local recreation would be negligible in these locations.

Alternative 2. Program-related population growth in the Great Falls urban area would result in an approximate 12.9-percent increase (9,620 inmigrants) above baseline totals by 1997 and decline to a 12.3-percent increase (9,200 inmigrants) by the year 2000. Impacts of Alternative 2 would be identical to those of the Proposed Action with programmed housing. Facility requirements necessary to maintain existing per capita ratios would be similar. Long-duration impacts would be moderate and significant. New neighborhood parks would not be needed because most of the population growth would occur at Malmstrom AFB. Program-induced population growth in Lewistown and Conrad would be similar to the Proposed Action, and therefore, impacts to local recreation in these two cities would be negligible.

Alternative 3. Impacts for Alternative 3 would be the same as for the Proposed Action.

4.5.4 Cumulative Impacts

4.5.4.1 Regional Recreation

If the Peacekeeper in Rail Garrison program and the Proposed Action are implemented, program-related population growth would result in an approximate 4.4-percent increase above baseline totals by 1996, declining to 4 percent by the year 2000. The cumulative recreation use would be approximately 9 percent higher than the Proposed Action (Table 4.5.2-2). However, even though the increased use for individual recreation areas would be slightly higher, the cumulative impacts of the Proposed Action and the Peacekeeper in Rail Garrison program would remain low and not significant as for the Proposed Action.

4.5.4.2 Local Recreation

If the Peacekeeper in Rail Garrison program and the Proposed Action are implemented, program-related population growth above baseline totals would be approximately 11.9 percent (8,850 inmigrants) by 1996, declining to 11.1 percent (8,310 inmigrants) by the year 2000 in the Great Falls urban area. Recreation facility requirements necessary to maintain existing per capita ratios are similar to those of Alternative 2, resulting in

both short- and long-duration, moderate, and significant impacts. New neighborhood parks would not be needed because most of the population growth would occur at Malmstrom AFB. Program-related population growth in Lewistown and Conrad would be similar to the Proposed Action. Impacts to local recreation would therefore be negligible in these cities.

4.5.5 Impacts of the No Action Alternative

Baseline population in the ROI is expected to increase by approximately 8 percent from 1986 to 1996 and by approximately 12 percent by the year 2000. In terms of increased regional recreation use, participation in individual activities is projected to increase proportionally to population growth with the highest absolute increases in use occurring in fishing and hunting activities. The various land divisions of the Lewis and Clark National Forest will continue to be the most heavily used recreation areas in the ROI for most activities. However, the Holter Lake and Canyon Ferry Lake recreation areas will continue to receive the highest use for water-based recreation activities such as boating and waterskiing. The proportion of use for each activity that will occur at individual recreation areas within the ROI is expected to remain about the same, though use will be higher in absolute terms.

Baseline forecasts for the Great Falls urban area show a population increase of about 4,000 or approximately 5.6 percent from 1986 to 1996 and an increase of 4,800 or slightly less than 6.8 percent by the year 2000. Approximately 60 percent of the baseline growth will be associated with the new KC-135R air refueling mission at Malmstrom AFB. Great Falls will not have an adequate supply of some recreation facilities during this period. To accommodate increased demand, the city will need to construct additional softball and golf facilities and will need to develop additional parkland in areas where growth is expected to occur. Parkland will be acquired through the land dedication provision of Montana's land platting regulations as additional subdivisions are developed. Staffing will need to be increased by approximately 20 percent (2-3 persons) to handle the expected expansion of the city's park and recreation system. Lewistown and Conrad have sufficient parkland and facilities to accommodate baseline growth.

4.5.6 Potential Mitigation Measures

Potential mitigations are measures that could be undertaken to reduce or eliminate program impacts. All, some, or none of the measures identified for recreation may be implemented. For each measure, the agencies that may be involved in implementation are identified. The Air Force would encourage implementation of these measures through environmental awareness and other programs. Potential mitigation measures for recreation include the following:

- Include measures in the environmental awareness program to inform program-related inmigrants about regulations applicable to various recreation activities. This mitigation measure would be effective in reducing the number of occurrences of such actions as trespassing on private lands or illegal fishing and hunting (U.S. Air Force in association with state and federal natural resource and recreation agencies).

- Analyze facility use to determine whether rescheduling or minor upgrading of facilities (e.g., lighting ballfields) might reduce impacts. This mitigation would be effective in accommodating the increased demand for facilities created by the program (Great Falls Park and Recreation Department).

- Expand cooperative agreements for use of city and school district recreation facilities. The city and school district currently have a cooperative agreement for use of some school district athletic facilities (e.g., gymnasiums) for the city's recreation program. This agreement could be expanded to include additional facilities to accommodate increased demand created by the program (Great Falls Park and Recreation Department and Great Falls Public Schools).

- Develop city/county and city/school district recreation facilities (e.g., construct new parks and schools adjacent to one another). Development (including provision of land) and operations and maintenance costs would be shared or predetermined on a contractual basis (participating city, county, or school district).

4.5.7 Irreversible and Irretrievable Resource Commitments

Impacts on regional and local recreation would not result in any irreversible and irretrievable commitment of resources.

4.5.8 Relationship Between the Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

There would be no impact on maintenance and enhancement of long-term productivity as a result of short-term use of recreation areas or facilities.

4.6 Visual Resources

The construction of proposed Small Intercontinental Ballistic Missile (ICBM) facilities at Malmstrom Air Force Base (AFB) and the deployment area would affect visual resources. Visual resources analyses include consideration of both rural areas and Malmstrom AFB.

4.6.1 Impact Analysis Methodology

The impact analysis methodology for visual resources involved three separate procedures: evaluation of program impacts, determination of levels of impact (LOI), and determination of the significance of impacts. The methodology also included consideration of a number of assumptions and assumed mitigations. Impacts were evaluated at the site level and an overall collective assessment was made. For visual resources, site-level impacts were evaluated for launch facilities at Malmstrom AFB and other construction sites.

4.6.1.1 Evaluation of Program Impacts

Visual resources would be affected to the extent that program deployment would alter the landscape as a result of construction of facilities and the clearing of existing vegetation from the land. The methodology used to identify these impacts was derived from the Bureau of Land Management's (BLM) Visual Resources Management (VRM) guidelines. An important part of the VRM process is to categorize program areas by their distance from viewers. For the Small ICBM analysis, it was assumed that any launch facility to receive a Hard Mobile Launcher (HML) shelter which is not visible from or within one-half mile of scenic or heavily traveled highways (highways with less than a 1985 average annual daily traffic [AADT] of 1,000) would have so few viewers that the impact on highway travelers would be negligible. There are 21 launch facilities that do not fall into this category; they are identified as the areas of intensive study. These 21 launch facilities are the principal subject of the impact analysis that follows.

For the Small ICBM visual resources analysis, photographs of the deployment area, land-form maps, and geographical descriptions from various sources were used to divide the deployment area into four landscape characteristic provinces (LCPs), as described in Section 3.6.3. The methodology then involved the rating of the degree of visual contrast between program facilities and each element of the existing landscape. The extent to which the proposed program may adversely affect the visual quality of the landscape depends upon the degree of contrast expected to occur between program facilities and the three existing landscape features found in each LCP: landform, vegetation, and structures. Each of these features consists of four elements: form, line, color, and texture (U.S. BLM 1986).

To determine the contrast rating for each feature at each LCP, one launch facility photograph from each LCP, representing the typical landscape of that LCP, was used to prepare with-program simulation drawings. Since there are no launch facilities visible from scenic or heavily traveled highways in the Foothills LCP, only three simulations were prepared: Mountains, Rolling Uplands, and Planar Uplands LCPs. These simulations were then used to define the degree of contrast for each element of each feature.

The four elements are defined and numerically weighted as follows:

Form. The mass or shape of an object or of objects which appear unified (4).

Line. The path that the eye follows, when perceiving abrupt differences in form color or texture, or when objects are aligned in a one dimensional sequence (3).

Color. The property of reflecting light of a particular intensity and wavelength to which the eye is sensitive (2).

Texture. The aggregation of small forms or color mixtures into a continuous surface pattern, the parts of which do not appear as discrete objects (1). (U.S. BLM 1986.)

The four degrees of contrast ratings are defined and numerically weighted as follows:

None. The element contrast is not visible or perceived (0).

Weak. The element contrast can be seen but does not attract attention (1).

Moderate. The element contrast begins to attract attention and begins to dominate the characteristic landscape (2).

Strong. The element contrast demands attention, will not be overlooked, and is dominant in the landscape (3). (BLM 1986.)

After the degree of contrasts had been judged, their weightings (0-3) were multiplied by the weightings of each element (1-4) to obtain the contrast score for each element of each feature. The feature scores for each LCP were then summed and averaged to obtain the contrast rating for each LCP.

Other program impacts on visual resources could result from improvements to roads and bridges, the opening or expansion of gravel quarries, and construction of program facilities at Malmstrom AFB. These actions were reviewed and impacts are discussed in Section 4.6.2.

4.6.1.2 Determination of Levels of Impact

Using the impact analysis methodology discussed in Section 4.6.1.1, there could be a maximum contrast rating score for each feature of 30 at any LCP location as shown below.

Element	Weight	Degree of Contrast		Score
Form	4X	Strong	3	12
Line	3X	Strong	3	9
Color	2X	Strong	3	6
Texture	1X	Strong	3	3
Maximum Score:				30

The BLM contrast rating guidelines state that any contrast rating score in excess of 21 is extreme. On the basis of these considerations, the following criteria were developed to assess impacts as negligible, low, moderate, or high.

- Negligible Impact -- Visual intrusions would not be noticeable and no mitigation would be necessary; contrast rating score less than 7.

- Low Impact -- Visual intrusions would be noticeable, but with the use of assumed mitigations they would not be objectionable; contrast rating score between 7 and 14.

- Moderate Impact -- Visual intrusions, even with assumed mitigations, would be objectionable to some viewers; contrast rating score between 14 and 21.

- High Impact -- Visual intrusions would be objectionable to a large number of viewers; contrast rating score greater than 21.

4.6.1.3 Determination of Significance

The significance of visual resources impacts were evaluated in accordance with Council on Environmental Quality (CEQ) regulations. Significance was assessed through evaluation of the context and intensity of the impacts. Context includes consideration of the settings (site, local, or regional) and the duration of the impacts. The CEQ regulations provide ten items that should be considered in evaluating intensity. Of these ten items, the following are applicable to visual resources:

- Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas;

- The degree to which the effects on the quality on the human environment are likely to be highly controversial; and

- The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.

In addition to the above considerations, which are specifically identified in the CEQ regulations, the following considerations are also appropriate for visual resources:

- The degree of visual contrast that the program facilities would have with the existing landscape; and

- The degree to which the visual impacts of the program would likely be highly controversial because of the extent of changes in the visual environment.

On the basis of these considerations it is determined that impacts on visual resources would be significant if construction of program facilities or other program actions create a major visual intrusion on the landscape of deployment area residents.

4.6.1.4 Assumptions and Assumed Mitigations

The following assumptions were made for the visual resources analysis:

- Only those program facilities that would be visible from, and located less than 0.5 mile from, any highway with an AADT of 1,000 or more in 1985, or is a scenic highway, would have sufficient exposure to public view to impose a visual impact other than negligible; and

- The findings of the BLM degree of contrast rating methodology represent the extent of public concern regarding the degradation of visual resources.

It is assumed that the following mitigations would be included in the Proposed Action:

- Landforms disturbed by the program would be restored to their original character consistent with good grading practices, and revegetated with appropriate plant species;

- Standard dust suppression methods would be used during the construction phase; and

- New onbase facilities would be designed to visually blend with existing architecture to the extent appropriate.

4.6.2 Impacts of the Proposed Action

Overall, both short- and long-duration impacts of the Proposed Action would be negligible. Only launch facility A-6, near Monarch on U.S. 89 (a scenic highway), would have a moderate site impact. Site impacts at 20 other launch facilities would be low, and impacts at the remaining 79 launch facilities would be negligible (Figure 4.6.2-1). Figure 4.0-1 shows the LOI at each of the 200 launch facilities in the deployment area from which 100 launch facilities would be selected for HML deployment.

The visual impacts of five types of program actions have been considered: (1) placement of earth-covered igloos at existing launch facilities, (2) improvement of roads and bridges in the deployment area, (3) the opening or enlargement of gravel quarries, (4) development of onbase facilities at Malmstrom AFB, and (5) the overall effect of new Air Force construction in the deployment area.

Earth-Covered Igloos at Existing Launch Facilities. One hundred existing Minuteman launch facilities would be selected to contain two earth-covered igloos each to shelter the HMLs. These igloos would be covered with several feet of earth which would slope toward ground level on all sides except for the entry door end, which would be of vertical-formed concrete. The two igloos would be placed about 50 feet apart, and each would appear to be a mound of earth about 25 feet high, 100 feet wide, and 165 feet long. A much smaller concrete masonry crew quarters (about 1,200 square feet) would be located near the igloos. Further descriptions of these facilities are found in Section 1.3.3.2.

It was assumed that all 21 of the Minuteman launch facilities visible from scenic highways and highways with an AADT of 1,000 (as identified in Section 3.6.3.2) would be used by the Proposed Action. Simulation drawings of the proposed igloos as they would appear in a typical landscape in each LCP were prepared (Figures 4.6.2-2 through 4.6.2-4)

VISUAL RESOURCES

	NUMBER OF LAUNCH FACILITIES													
	SHORT DURATION							LONG DURATION						
	NOT SIGNIFICANT				SIGNIFICANT			NOT SIGNIFICANT				SIGNIFICANT		
ELEMENT	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH
VISUAL RESOURCES	**179**		**21**					**179**	**20**	**1**				

Note: The data shown are for the earth-covered igloo (Proposed Action and Alternative 2). For the pre-engineered building (Alternatives 1 and 3), short-duration impacts would be the same. Long-duration impacts would be 199 negligible and 1 high (A-6).

Note: Site impacts at individual launch facilities are illustrated in Figure 4.0-1.

EM4/6

FIGURE 4.6.2-1 SUMMARY OF SITE IMPACTS TO VISUAL RESOURCES ASSOCIATED WITH PROPOSED SMALL ICBM CONSTRUCTION AND OPERATIONS AT LAUNCH FACILITIES IN MONTANA

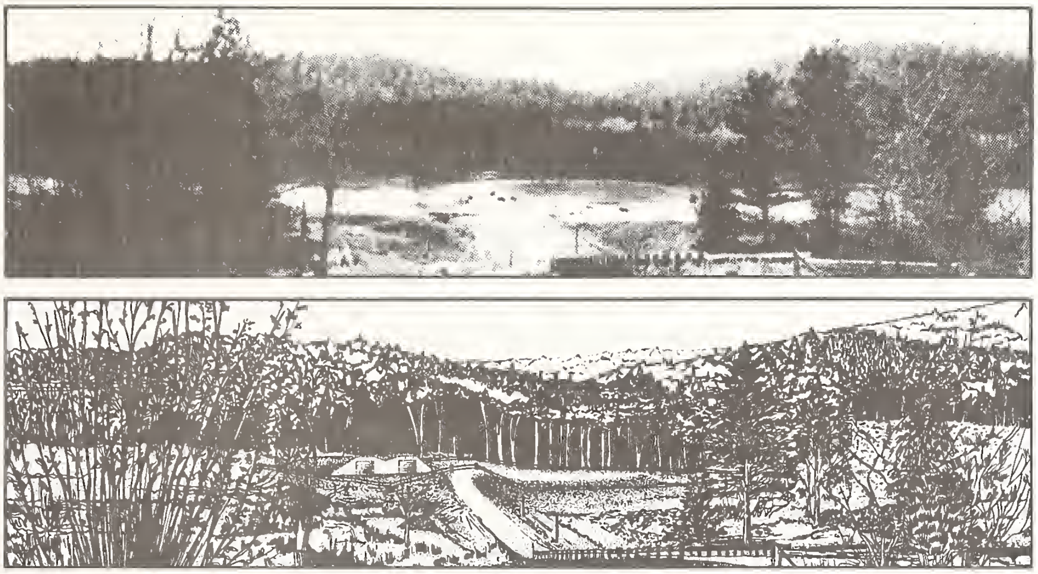

FIGURE 4.6.2-2 SIMULATION OF LAUNCH FACILITY A-6, MOUNTAINS LANDSCAPE CHARACTERISTIC PROVINCE

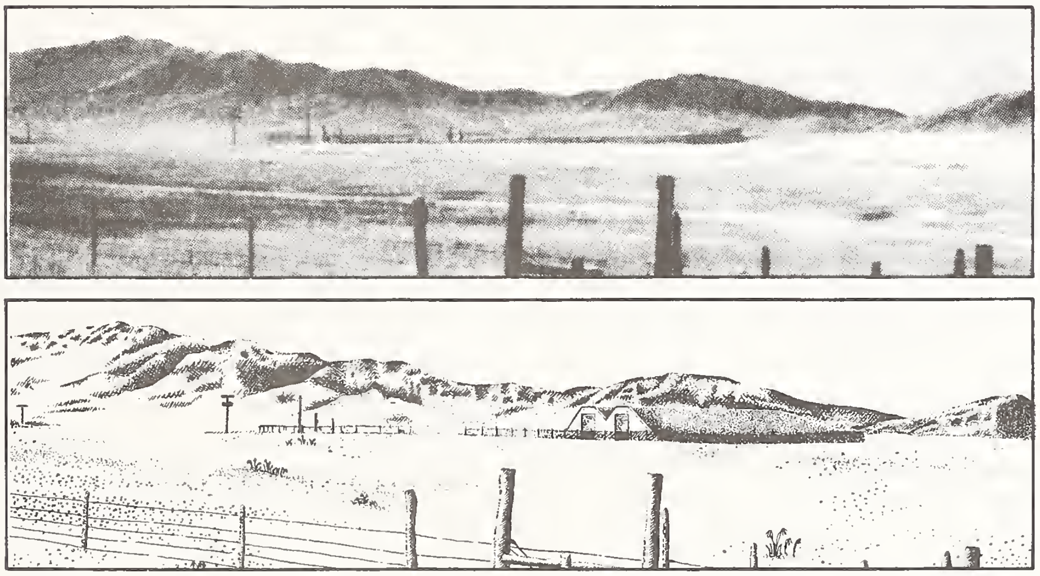

FIGURE 4.6.2-3 SIMULATION OF LAUNCH FACILITY G-2, ROLLING UPLANDS LANDSCAPE CHARACTERISTIC PROVINCE

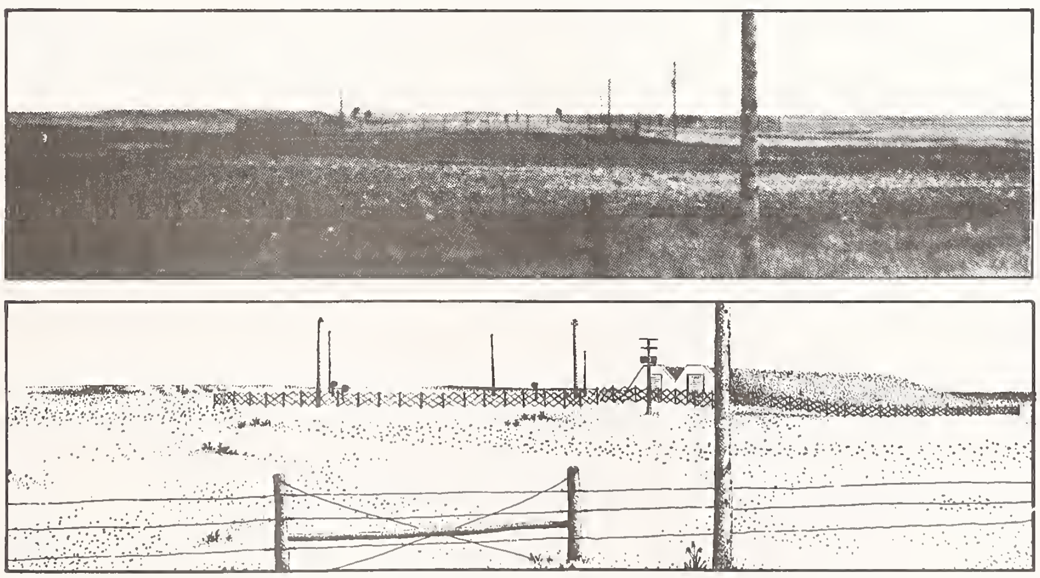

FIGURE 4.6.2-4 SIMULATION OF LAUNCH FACILITY Q-20, PLANAR UPLANDS LANDSCAPE CHARACTERISTIC PROVINCE

EM4-VR/1 EM4-VR/2 EM4-VR/3

and contrast evaluations were made. Although program contrast scores for the Mountains LCP were judged to be moderate, only one of the 21 launch facilities is located there. Nine launch facilities are located in the Rolling Uplands LCP and 11 in the Planar Uplands LCP (Section 3.6.3, Table 3.6.3-1). Table 4.6.2-1 describes the degree of contrast ratings for each element of the landscape features at each of the three LCPs which would have at least one of the 21 earth-covered igloos. The results of the analysis indicate that overall short- and long-duration program impacts on visual resources at the launch facilities would be negligible. This is because only one of the 21 intensive study launch facilities is located in the Mountains LCP and it would have a moderate impact. The other 20 intensive study launch facilities are located in the Rolling Uplands and the Planar Uplands LCPs and would have a low impact. The remaining 79 launch facilities are outside the intensive study area and would have a negligible impact. All impacts would be in the areal context of the launch facility site, and not in the context of local, state, or regional or national.

Road and Bridge Improvements. Road and bridge improvements would take place along most of the transporter/erector (T/E) routes. The visual intrusion of this road work would look like any other road construction and would be temporary, with most cleared areas grown over within 1 or 2 years. Both short- and long-duration impacts are judged to be negligible.

Gravel Quarries. Because of program demand for roadway gravel on a number of T/E routes in the deployment area, some existing quarries may require enlargement, and some new quarries may need to be opened (see Section 4.10, Geology and Soils). Gravel use and its sources would be well distributed across the deployment area. This means that expansion at each quarry site would be small and new sites would also be relatively small. The extent of visual intrusion by quarries would depend upon their proximity to heavily used (and scenic) highways. Most quarries, however, have a low profile, and therefore would generally have low visibility. Visual intrusions would include the quarry pit itself, vehicles and machinery operating at the sites, and fugitive dust created by such operations. For individual quarries adjoining scenic or heavily traveled highways, visual impacts could be much higher.

Malmstrom Air Force Base. Construction activities at Malmstrom AFB would include the clearing of vegetation for building sites, road systems, rail systems, and earth movement for construction of various support and deployment facilities. The HML vehicle operations training and maintenance area facility buildings would be limited to a maximum of about 35 feet in height, and would look similar to existing Minuteman support facilities. The proposed site for these facilities is about 30 acres and is located about 4,000 feet from U.S. 87/89 near the southeast boundary of the base (Section 1.3.3, Figure 1.3.3-2), and for the most part is below the line-of-sight from U.S. 87/89. Even from those few locations on the highway where the program support facilities could be seen, they would be so low on the horizon that they would not be noticeable to the casual observer. An area of 600 acres adjoining the east boundary of the base would be cleared for the HML training area. The only anticipated visual effect of this action would be fugitive dust created by HML movements because the area is over 1.5 miles from U.S. 87/89. For these reasons, both short- and long-duration program impacts on visual resources at Malmstrom AFB are judged to be negligible.

Overall Effects on Visual Resources. The presence of Small ICBM facilities in the deployment area would affect two types of viewers: persons who live in north-central Montana, and tourists who come to or pass through Montana at least partly because of its scenic landscapes. There are approximately 93 occupied residences located within

Table 4.6.2-1

Proposed Small ICBM Program Landscape Characteristic Province Contrast Ratings for North-Central Montana

Features		Mountains LCP[1]			Rolling Uplands LCP			Planar Uplands LCP		
Elements		Degree of Contrast		Score	Degree of Contrast		Score	Degree of Contrast		Score
Landform										
Form	4X	medium	2	8	none	0	0	weak	1	4
Line	3X	medium	2	6	none	0	0	weak	1	3
Color	2X	strong	3	6	weak	1	2	weak	1	2
Texture	1X	medium	2	2	weak	1	1	weak	1	1
Subtotal:				22			3			10
Vegetation										
Form	4X	weak	1	4	weak	1	4	weak	1	4
Line	3X	weak	1	3	weak	1	3	weak	1	3
Color	2X	weak	1	2	weak	1	2	weak	1	2
Texture	1X	weak	1	1	weak	1	1	weak	1	1
Subtotal:				10			10			10
Structures										
Form	4X	medium	2	8	weak	1	4	weak	1	4
Line	3X	medium	2	6	weak	1	3	weak	1	3
Color	2X	medium	2	4	weak	1	2	weak	1	2
Texture	1X	medium	2	2	weak	1	1	weak	1	1
Subtotal:				20			10			10
TOTAL Scores:				52			23			30
Averaged Scores (Total÷3)				17.33 (moderate)			7.67 (low)			10.00 (low)

Note: [1]LCP = Landscape characteristic provinces are areas where the features of the landscape (landform, vegetation, and structures) are similar.

1,200 and 2,000 feet of 46 existing launch facilities that could have their visual environment slightly changed by the construction of the proposed HML shelters, depending upon which launch facilities are used and intervening topography. Effects on visual resources would result not only from the construction and grading activities previously described, but also from the greater activity generated by additional construction vehicles and grading equipment. Further, because the Minuteman system has been in place for over 20 years and because evidence of its deployment is not readily visible, there is little awareness, especially by tourists, that a missile field exists there. With the construction of HML shelters, and the added movement of the HML and military vehicles, both local residents and tourists would become more aware of the existence of missile deployment in the area. This means that the scenic resources of north-central Montana may be diminished to some extent beyond that created by the physical placement of shelters and additional traffic on rural roadways. This effect would be more important to local residents than to tourists because there are many more of them, because they are there on a permanent basis, and because it affects their home community environment.

Short-duration impacts on visual resources would result from the movement of construction vehicles and equipment, the storage of construction materials, and fugitive dust caused by the movement of equipment. Such short-duration impacts would be no different than those of any other construction work. They are judged, of themselves, to be negligible, but in combination with the impacts of igloo construction, impacts are judged to be moderate for all areas of intensive study at the launch facilities.

4.6.3 Impacts of Alternatives

Three program alternatives are being considered in addition to the Proposed Action. Like the Proposed Action, overall impacts of the alternatives on visual resources are judged to be negligible.

Alternatives 1 and 3. For Alternative 1, 100 of the launch facility sites would be used to deploy 200 HMLs (2 per site); for Alternative 3, all 200 launch facilities would be used to deploy 200 HMLs (1 per site). For Alternative 1, the HMLs would be sheltered in 60 by 120 by 25-foot-high pre-engineered corrugated metal, gable-roofed buildings instead of earth-covered igloos. For Alternative 3, the structures would be only 30 feet wide. As with the Proposed Action, it was assumed that all 21 of the launch facilities visible from scenic and heavily traveled highways would be used for deployment. For Alternative 3, since all launch facilities would be used, these same 21 must be included in the analysis. Because there would be only minimal earth grading, landform contrasts would be weak. Likewise, there would be no vegetation planted at the launch facility sites, and therefore, only weak vegetation contrasts as a result of site clearing. The large pre-engineered buildings would be obvious to passersby. However, they would look very much like many agricultural storage buildings found throughout the deployment area. The result of the analysis is that the one launch facility in the Mountains LCP (A-6) would have a high impact on visual resources, and the other 20 launch facilities in the area of intensive study in the Rolling Uplands and Planar Uplands would have a negligible impact (as would all nonintensive study area launch facilities). The visual impacts of other program activities would be the same as for the Proposed Action. For these reasons, overall short- and long-duration impacts of Alternatives 1 and 3 are judged to be negligible.

Alternative 2. For Alternative 2, 250 HMLs would be placed at 125 yet to be chosen launch facility sites, and would be sheltered in earth-covered igloos, as with Proposed

Action deployment. It was assumed that all 21 of the launch facilities visible from scenic and heavily traveled highways would be used. Visual impacts of other program activities would be the same as for the Proposed Action. With these assumptions and conditions, both short- and long-duration impacts of Alternative 2 on visual resources are judged to be negligible.

4.6.4 Cumulative Impacts

There are no other known major programs in the Small ICBM offbase deployment area that would add to the visual impacts created by the proposed program. The Peacekeeper in Rail Garrison program at Malmstrom AFB could have some effect on visual resources.

The Peacekeeper in Rail Garrison facilities are proposed to be located about 2,000 feet southeast of the base runway, and about 2,500 feet (at the closest point) north of U.S. 87/89. The facilities would consist of rail lines, a Weapons Storage Area, and a series of earth-covered train shelters. These shelters would be about 500 feet long, 120 feet wide, and about 25 feet high. They would appear to be a series of parallel linear mounds in an area occupying about 125 acres east of the runway.

The ground elevation of the shelters would be about 30 feet lower than U.S. 87/89 (at the closest point). There is also an area between U.S. 87/89 and the proposed Peacekeeper in Rail Garrison facility that is about 20 feet higher than the highway. This means that at the closest point, the facilities would not be visible from the highway. About 3,000 feet east of the south gate on U.S. 87/89, the Peacekeeper in Rail Garrison facilities could be visible without intervening topography. The distance at this point, however, would be about 6,000 feet, and the facilities would be unnoticeable. For these reasons, the Peacekeeper in Rail Garrison system at Malmstrom AFB would not add to the negligible impacts on visual resources found for the Small ICBM system.

4.6.5 Impacts of the No Action Alternative

The No Action Alternative will allow the rural setting of the deployment area to remain undisturbed. The elements of line and texture will continue to dominate the landscape. At Malmstrom AFB, there will be a minor visual change resulting from the introduction of support facilities for the KC-135 air refueling mission to be in place by 1988.

4.6.6 Potential Mitigation Measures

No mitigation measures are recommended for visual resources beyond the assumed mitigations discussed in Section 4.6.1.4.

4.6.7 Irreversible and Irretrievable Resource Commitments

No irreversible and irretrievable resource commitments are identified as a result of visual resource impacts.

4.6.8 Relationship Between the Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Implementation of the Proposed Action would create short-term disruptions to visual quality in the deployment area because of soil and vegetation disturbances and visual contrasts created between program structures and the existing landforms. Over the long term, soil and vegetation conditions would improve and diminish the short-duration impacts.

4.7 Cultural and Paleontological Resources

The proposed deployment of the Small Intercontinental Ballistic Missile (ICBM) system has the potential to affect cultural and paleontological resources. Impacts were evaluated separately for prehistoric, historic, Native American, and paleontological resources.

4.7.1 Impact Analysis Methodology

The impact analysis methodology for cultural and paleontological resources involved three separate procedures: evaluation of program impacts, determination of levels of impact (LOI), and determination of the significance of impacts. The methodology also included consideration of a number of assumptions and assumed mitigations. Impacts were evaluated at the site level for launch facilities, transporter/erector (T/E) routes, and Malmstrom Air Force Base (AFB). An overall assessment was made for each resource element relative the the north-central Montana region. Impacts to cultural resources that are eligible for the National Register of Historic Places (NRHP) also have importance at the state and national levels.

4.7.1.1 Evaluation of Program Impacts

The impact analysis methodology was similar for all types of resources except that the evaluation procedures varied somewhat, depending on the types of data available for different resource elements. Most of the study area has not been surveyed for cultural and paleontological resources, so impact evaluations were based on a sensitivity analysis. Existing data were used to project resource probabilities for the entire study area. Impacts were determined by assessing the likelihood that important resources will be affected, the relative susceptibility of those resources to damage, and the kinds of effects expected. The sensitivity ratings were summarized on map overlays which were compared to program impact areas. Both direct and indirect impacts were considered, and beneficial impacts were noted where applicable. The evaluation of impacts to prehistoric and historic resources focused on NRHP-eligible properties. Identification of potentially eligible site types was coordinated with the Montana State Historic Preservation Officer (SHPO). Cultural and paleontological resources are nonrenewable; physical damage results in a permanent loss of information. Therefore, with the exception of some types of effects on Native American resources, impacts would be of long duration regardless of whether they occur during the construction or operations phase of the program.

4.7.1.2 Determination of Levels of Impact

Impacts to prehistoric, historic, and paleontological resources would occur primarily as a result of construction-related ground disturbance. Sources of impacts include activities such as expansion of launch facilities, road improvements, bridge replacement, and expansion of aggregate sources. Impacts may also include vandalism and unauthorized artifact collecting resulting from the presence of greater numbers of people in the vicinity of sites. All such disturbances are considered to be adverse and permanent because they can eliminate or reduce a site's qualification for the NRHP or its research potential. The LOIs were determined by projecting the relative numbers and kinds of resources likely to be affected. The severity of impact was also considered in its effect on NRHP eligibility, or future research potential.

Native American resources are affected by physical disturbances, but they may also be affected in other ways. The privacy resulting from isolation is an important aspect of some sacred sites. The suitability of such areas for ritual use can be adversely affected by visual and auditory intrusions, in addition to physical disturbance. Some sacred areas may be desecrated simply by the presence of non-Indians. For other kinds of resources, impacts may result from short-term interruption of Native American use of resource areas. In such instances, temporary or reversible impacts contribute to lower LOIs than would be identified for permanent impacts. The LOIs vary according to the proximity of a resource to the impact area, and to the relative religious importance of different site types.

Prehistoric Resources. The LOI was keyed to the proportion of impact areas affecting predicted high-sensitivity zones (Section 3.7.2.2). For prehistoric resources, the following LOIs were identified:

- Negligible Impact -- No NRHP-eligible resources are likely to be affected.
- Low Impact -- High-sensitivity zones occur in less than 30 percent of the impact areas. Few NRHP-eligible sites are likely to be affected, and they make up a small portion of sites of a given type in the study area.
- Moderate Impact -- High-sensitivity zones occur in 30 to 74 percent of the impact area, and some NRHP-eligible sites are likely to be affected.
- High Impact -- High-sensitivity zones comprise at least 75 percent of the impact area, and many eligible sites are likely to be affected. The loss of resources would substantially limit the research potential of the remainder of the resource base in the study area.

Historic and Architectural Resources. Because all historic resources in the study area have not been recorded, the LOI is based on proximity to known resources as an indicator of the potential to affect additional, unrecorded sites. For historic and architectural resources, the following LOIs were identified:

- Negligible Impact -- No NRHP-eligible resources are likely to be affected.
- Low Impact -- Few NRHP resources are likely to be affected, and they make up a small percentage of a given site type in the study area. Nearby unoccupied structures may be affected as a result of increased public use of the area.
- Moderate Impact -- NRHP-eligible resources are known to occur within a mile of direct impact areas, and associated unrecorded sites may be affected.
- High Impact -- A large proportion of NRHP-eligible resources of a given type within the study area is likely to be destroyed, damaged, or altered. Known NRHP-eligible properties occur within the direct impact area.

Native American Resources. The LOIs were estimated by measuring the proximity of impact areas to different types of known or projected resources. It was assumed that existing data on known sites would provide a minimal estimate of Native American resources likely to be affected and that physical features may represent only points within a larger sacred area. Native American input to the analysis was solicited by

consulting a number of tribes having historic associations with the deployment area. The level of concern over program impacts varied by tribe and by site type. Construction activities visible or audible from very important religious sites could cause higher impacts than activities occurring on or adjacent to a less important site type. In order to accommodate such variability, known or projected resources were buffered for the purposes of measuring proximity, and the following general guidelines were adopted. High potential impacts were identified within a distance of 2 miles from a known burial ground, the most sensitive site type in the study area. Moderate impacts were identified when impact areas were within 1 mile of a known site with a ceremonial feature (e.g., medicine wheel, ceremonial tipi, or vision quest structure). When impact areas were within 5 miles of known sites with sacred significance, low impacts were identified in recognition of the potential for encountering additional such sites in the area. Negligible impacts were recorded for areas where no resources are known or projected to occur. For Native American resources, the following LOIs were identified:

- Negligible Impact -- No projected changes in the resource would occur.
- Low Impact -- Program effects may cause a slight reduction in the quality of traditional use resources that may be restored or that are available elsewhere. No change in the suitability of sacred areas for religious purposes would occur.
- Moderate Impact -- Program effects may lead to either a reduction in the quality of resources, or a reversible change in access to or the suitability of a resource for religious purposes.
- High Impact -- Program effects may cause irreversible or long-term reduction in resource quality that reduces its suitability for sacred or other traditional uses.

Paleontological Resources. The LOI determinations for paleontological resources are related directly to the richness of geologic units occurring in the impact areas and to the amount of disturbance that would occur. The following LOIs were identified for paleontological resources:

- Negligible Impact -- No known or projected resources would be affected.
- Low Impact -- Affected geologic units contain fossils having little scientific research potential.
- Moderate Impact -- Important resources are known or projected to occur in impact areas, but their distribution indicates avoidance may be possible.
- High Impact -- Important paleontological localities are known within the disturbed area. The size and/or configuration of the area to be affected suggests that avoidance may be difficult.

4.7.1.3 Determination of Significance

The significance of cultural and paleontological resource impacts were evaluated in accordance with Council on Environmental Quality (CEQ) regulations. Significance was assessed through evaluation of the context and intensity of the impacts. Context includes consideration of the settings (site, local, or regional) and the duration of the

impacts. The CEQ regulations provide ten items that should be considered in evaluating intensity. Of these ten items, the following are applicable to cultural and paleontological resources:

- Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas;

- The degree to which the effects on the quality of the human environment are likely to be highly controversial;

- The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration;

- Whether the action is related to other actions with individually insignificant but cumulatively significant impacts;

- The degree to which the action may adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the NRHP or may cause loss or destruction of significant scientific, cultural, or historical resources; and

- Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

In addition to these considerations, which are specifically identified in the CEQ regulations, the following considerations were judged appropriate for archaeological resources:

- Whether the Proposed Action affects the research potential of a property relative to regional research priorities; and

- Relative rarity of specific site types.

On the basis of these considerations, criteria were developed to assess impacts as significant or not significant.

Prehistoric and Historic Resources. Potential impacts to prehistoric or historic resources were considered significant if either of the following conditions apply:

- The proposed program could substantially add to existing disturbance of resources in the Region of Influence (ROI); or

- The proposed program may adversely affect NRHP-eligible resources or may cause loss or destruction of important scientific, cultural, or historical resources.

Identifiable but not significant impacts could occur if the affected sites are not likely to be eligible for the NRHP. The condition most likely to produce this result is extensive previous disturbance which has eliminated a site's research potential.

Native American Resources. Impacts to Native American resources were considered significant if professional judgment indicated that either of the following conditions could occur as a result of the proposed program:

- A potential for affecting sites important for their position in the Native American physical universe or belief system; or

- The possibility of reduced access to traditional use areas or sacred sites.

Additionally, where a documented history of Native American concern for sacred sites was identified, this history was considered noteworthy, and was a contributor to significance determination because of the increased likelihood that Native Americans may identify previously unknown sacred sites in the area.

Paleontological Resources. The NRHP criteria for identifying eligible resources are not relevant to paleontological materials. The level of importance of various types and frequencies of fossil occurrences is related to their relative rarity, depositional integrity, and research potential. Impacts were considered significant if they affected deposits with high research potential, defined as areas with a formation containing:

- Numerous vertebrate fossil localities and/or specimens, particularly if the specimens represent a diverse vertebrate assemblage;

- Associated vertebrate and invertebrate or plant fossil localities and/or specimens;

- Vertebrate specimens representing comparatively rare species; and

- Abundant, diverse invertebrate assemblages.

4.7.1.4 Assumptions and Assumed Mitigations

Activities will be directed, when possible, to minimize harm to prehistoric resources listed in or eligible for the NRHP. Additionally, all properties under Air Force jurisdiction affected by the program will be located and inventoried, and those appearing to be eligible for the NRHP will be nominated. Specific mitigation measures likely to be involved include avoidance of resources through facility redesign, stabilization of sites which can be preserved in place, and data recovery analysis and reporting when important sites cannot be avoided. Consultation with the Advisory Council on Historic Preservation (ACHP) and the Montana SHPO pursuant to the ACHP regulations, Protection of Historic Properties (Code of Federal Regulations 1983, 36 CFR 800), and other applicable regulations, has resulted in a preliminary Programmatic Agreement (PA) (Appendix B.2). The PA establishes procedures for determining what mitigation measures will be implemented as the program proceeds.

4.7.2 Impacts of the Proposed Action

The proposed program is likely to result in impacts to all resource elements (Figure 4.7.2-1). Prehistoric resources would be affected by construction-related ground disturbances throughout the study area, but most impacts would occur in the vicinity of river and stream crossings. The number of sites likely to be affected is low relative to the overall regional resource base. Impacts are judged to be significant because some NRHP-eligible sites are likely to be affected. Historic and architectural resources would

CULTURAL AND PALEONTOLOGICAL RESOURCES

ELEMENT	NUMBER OF LAUNCH FACILITIES													
	SHORT DURATION							LONG DURATION						
	NOT SIGNIFICANT				SIGNIFICANT			NOT SIGNIFICANT				SIGNIFICANT		
	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH
PREHISTORIC												61	101	38
HISTORIC AND ARCHITECTURAL								185				10	5	
NATIVE AMERICAN								186				11	2	1
PALEONTOLOGICAL								1	91			6	100	2

Note: All cultural and paleontological resource impacts are assumed to be long duration.

Note: Site impacts at individual launch facilities are illustrated in Figure 4.0-1.

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FIGURE 4.7.2-1 SUMMARY OF SITE IMPACTS TO CULTURAL AND PALEONTOLOGICAL RESOURCES ASSOCIATED WITH PROPOSED SMALL ICBM CONSTRUCTION AND OPERATIONS AT LAUNCH FACILITIES IN MONTANA

also experience low and significant impacts. Some historically important bridges are likely to require upgrading or replacement. In addition, vacant historical structures may be affected indirectly through increased vandalism. Impacts to Native American resources would be low because few sensitive areas occur in the vicinity of existing facilities. Any impacts would be significant because of the religious or heritage importance of sensitive areas. The main concern would be the possibility of encountering burials during construction. Impacts to paleontological resources are estimated to be moderate and significant because of the potential for affecting internationally important fossil assemblages. Although there would be some range in site-level impacts for all resource elements, the overall LOIs are not dependent on launch facility selection. All identified impacts are considered to be of long duration.

4.7.2.1 Prehistoric Resources

Regional impacts of the Proposed Action on prehistoric resources would be low and significant. Site impacts at Malmstrom AFB would be low and significant. Overall impacts at launch facilities would be either low or moderate and significant depending upon which launch facilities are selected. Overall impacts resulting from road and bridge improvements would be low and significant, with the most sensitive areas occurring at bridge crossings.

Malmstrom Air Force Base. The Proposed Action at Malmstrom AFB includes the construction of Small ICBM facilities and the acquisition of 165 to 330 acres for additional housing and 600 acres for the Hard Mobile Launcher (HML) vehicle operations training area. The total disturbed area at the base is estimated to be 1,160 acres. Even though the housing expansion and HML vehicle operations training areas are presently under cultivation, important resources may remain. Lithic scatters and campsites (as opposed to tipi ring sites) may retain considerable research potential in spite of agricultural disturbance. Surface and shallow subsurface archaeological sites located in the HML vehicle operations training area may be disturbed or destroyed through crushing from the weight of the HML and/or the churning of the surface from the wheels. Scraping of the surface by the HML undercarriage may also disturb sites.

Malmstrom AFB contains areas in sensitivity Zones 1, 2, and 4. Four sensitivity zones (Figure 3.7.3-2) were derived from the predictive model (Section 3.7.3.1) and provided the basis for assessing impacts. Zone 4 is the highest sensitivity zone, located along drainages and in areas of moderate relief near water. Site types in this zone consist of buried or stratified camps and processing sites as well as large stone circle sites and open camps. Zones 3 and 2 are classified as medium-sensitivity zones located in areas of transitional slope. Site types in these zones include stone circle sites, camps, and processing sites. Zone 1 is the lowest sensitivity zone located in areas of high or moderate relief and areas with nearby water. Small campsites and limited activity sites occur in Zone 1. The proposed housing development would be situated on the north edge of the base in Zone 4; however, a recent cultural resource inventory indicates no prehistoric sites in this area. Site-level impacts at this location are negligible. Additional Small ICBM facilities would occur in developed areas in the base proper and in previously disturbed areas east and southeast of the existing flightline. These areas consist of 230 acres in Zones 1 and 2 which may contain small campsites or stone circle sites. The HML vehicle operations training area would consist of 600 acres acquired on the eastern edge of the base in previously cultivated areas (sensitivity Zone 2). Two prehistoric sites have been identified in this eastern area but have not been evaluated for NRHP eligibility. Overall impacts of the Proposed Action on Malmstrom AFB are considered to be low and significant.

Housing Option H1. This option consists of constructing only half as much onbase housing as for the Proposed Action. The 165 acres to be acquired occurs in a high sensitivity zone, but no prehistoirc sites were located during a recent inventory. Site-specific impacts for this area would be negligible. Impacts of the Proposed Action with Housing Option H1 are still considered to be low and significant.

Housing Option H2. This option consists of no additional onbase housing, and additional land would not be required. Even though no disturbance would occur in high sensitivity zones, there is the possibility of identifying eligible sites in Zones 1 and 2 which include the rest of the disturbed areas onbase. Therefore, overall impacts of the Proposed Action with Housing Option H2 at Malmstrom AFB are considered to be low and significant.

Launch Facilities. An additional 300 acres would be acquired for launch facility expansion to accommodate construction of HML enclosures and contractor staging areas at 100 launch facilities. Disturbance at the launch facilities is expected to include 1.4 acres of temporary disturbance (i.e., construction staging area) and 1.6 acres of permanent disturbance. However, any ground disturbance, whether temporary or permanent, would have long-duration effects on prehistoric resources. Acquired areas would encompass portions of adjacent agricultural and grazing lands which may already have experienced varying degrees of minor surface disturbance. However, subsurface portions of sites in these areas may still be intact. Because specific launch facilities have not yet been selected, analyses were undertaken for all 200 locations.

Site-specific analysis of individual locations indicate 38 launch facilities occur in sensitivity Zone 4 (Table 4.7.2-1), which may contain buried campsites or processing sites, large stone circle sites, and campsites. Site-specific impacts to these 38 launch facilities may be high and significant because these zones have the highest probability of containing potentially eligible sites. Within medium sensitivity zones (Table 4.7.2-1: Zones 2 and 3), which have a lower probability of containing potentially eligible sites, 101 launch facilities occur. Site types located in these zones may include stone circle sites, campsites, and processing sites. Site-specific impacts are expected to be moderate

Table 4.7.2-1

Distribution of Launch Facilities Within Prehistoric Resource Sensitivity Zones

Sensitivity Zone	Percent in Study Area	Launch Facilities No.	Launch Facilities Percent
4	25.0	38	19.0
3	16.7	36	18.0
2	28.0	65	32.5
1	30.3	61	30.5
TOTAL:	100.0%	200	100.0%

and significant. Sixty-one launch facilities occur in sensitivity Zone 1, which has the lowest probability of containing eligible sites. Small campsites and limited activity sites most likely occur in this zone. Site-specific impacts to these launch facilities are considered low and significant.

Seven launch facilities (A-8, C-6, G-2, G-6, H-2, P-2, and Q-15) are located near known prehistoric site clusters. However, these site clusters indicate the extent of previous research. The remaining 193 launch facilities occur in unstudied areas in the region. Clusters of stone circle sites are located in upland settings in the vicinity of launch facilities G-2, H-2, P-2, and Q-15. Clusters of pictograph sites occur in bluff areas and canyons near launch facilities A-8 and C-6.

If all 38 launch facilities located in high sensitivity zones were selected for the Proposed Action, impacts would be moderate because the cumulative percentage would be 38 percent. If none of these 38 launch facilities were selected, impacts would be low. The overall LOI for launch facility expansion and HML enclosure construction ranges from low to moderate depending upon which launch facilities are selected. Because minimal surface disturbance may have occurred in the areas around each launch facility, site integrity is expected to be better than in other previously disturbed areas such as road easements. Impacts are considered significant because some potentially eligible sites may be identified.

Deployment Area Roads. A variety of road upgrades are likely to occur, including widening of roads and intersections and making structural improvements to road surfaces. Road segments crossing rivers and streams would also have various effects depending upon whether the bridges are widened or replaced, and whether detour crossings or construction staging areas would be required. Impact areas along roads are narrow strips previously disturbed by initial road construction and maintenance. Archaeological reconnaissance by Air Force contractors indicates that previous disturbance in road easements has greatly reduced the potential for encountering NRHP-eligible sites except in those areas where buried deposits are likely. However, resources located beyond the road right-of-way may have only minimal surface disturbance and good site integrity. Buried archaeological deposits on floodplains and terraces (i.e., bridge crossings) may have excellent site integrity. Sites in both types of settings may be eligible.

The distribution of potential T/E route upgrade areas in different sensitivity zones is summarized by county in Table 4.7.2-2. Wheatland County has the highest proportion of road segments occurring in sensitivity Zone 4 (86%). The least sensitive counties are Toole and Pondera, with 100 percent and 93 percent, respectively, of road segments occurring in sensitivity Zone 1. Site-level analysis of individual road segments indicate 16 percent of the roads occur in Zone 4. Because of the greater probability that buried, undisturbed sites occur in these zones, impacts are considered to be high and significant. Approximately 34.8 percent of roads occur in sensitivity Zones 2 and 3. Impacts along these road segments are projected to be moderate and not significant because sites are likely to occur near the surface and would have been disturbed in the road rights-of-way. About 49 percent are located in Zone 1 and site-specific impacts to these segments are considered to be low and not significant because heavily disturbed surface sites are not likely to be eligible. General impacts from road construction, based on cumulative percentages, are projected to be low and significant.

Eighty-one of the 124 bridges scheduled to be improved for the Proposed Action cross rivers or drainages. Most of these (60%) cross drainages in sensitivity Zone 4. The

Table 4.7.2-2

Distribution of Potential Road Upgrade Areas in Prehistoric Resource Sensitivity Zones

County	Percent of Road Upgrade Areas in				Total
	Zone 4	Zone 3	Zone 2	Zone 1	
Cascade	23.7	4.7	31.1	40.5	100.0
Chouteau	0	10.6	15.2	74.2	100.0
Fergus	2.5	8.8	37.7	51.0	100.0
Judith Basin	29.5	14.7	36.8	19.0	100.0
Lewis and Clark	19.0	29.3	2.9	48.8	100.0
Pondera	6.8	0	0	93.2	100.0
Teton	23.4	5.8	22.0	48.8	100.0
Toole	0	0	0	100.0	100.0
Wheatland	85.8	0	14.2	0	100.0
All Counties	16.0	8.6	26.2	49.2	100.0

results of previous research in the area indicate a 20-percent probability of locating prehistoric sites at any given point along a river. Site-specific impacts at river or drainage crossings located in sensitivity Zone 4 would be high and significant because of the increased probability of encountering buried sites which would be eligible. Site-specific impacts at drainage crossings in sensitivity Zones 2 and 3 would be moderate and significant. Site-specific impacts at drainage crossings in Zone 1 would be low and significant. The remaining 43 bridges cross stockpasses, canals, highways, and railroads. Because such features could not have conditioned prehistoric settlement the way drainages did, bridges over them generally occur in areas of lower sensitivity. Previous construction disturbances further reduce the likelihood of encountering important intact resources in the vicinity of these latter bridges. Overall impacts resulting from bridge construction would be moderate and significant.

Expansion of some aggregate sources would be an indirect effect of the Proposed Action resulting from the procurement of construction materials. Aggregate materials would be used in construction of the HML shelters at the launch facilities and for road resurfacing and widening. Specific aggregate sources have not been identified, but most existing sources occur in high sensitivity zones along drainages.

4.7.2.2 Historic and Architectural Resources

Overall impacts to historic and architectural resources as a result of the Proposed Action would be low and significant. Impacts of onbase construction, including possible base expansion to the north and east, would be low and not significant. Launch facility construction impacts would range from low to moderate and significant, depending on which launch facilities are selected. Upgrades of roads and bridges would have low impacts, but some site-level impacts would be high and significant.

Malmstrom Air Force Base. Impacts to historic and architectural resources on Malmstrom AFB are expected to be low and not significant regardless of which housing option is chosen. No historic sites have been recorded in the housing construction or HML vehicle operations training areas. While it is possible that subsurface historic materials may be discovered, it is not likely because of the young age of the base and the lack of documentary evidence for earlier historic occupations in the base area.

Four buildings on Malmstrom AFB old enough to be eligible for the NRHP would be affected by the Small ICBM program: buildings 1308, 280, 210, and 205. However, on the basis of preliminary evaluation, these buildings do not appear to be eligible for the NRHP. They can be characterized as typical of World War II construction, built hastily with available materials and intended to last only a limited time. Consultation with the SHPO would be necessary to determine their significance and the nature of the effect, but it is expected to result in a determination of not eligible.

Launch Facilities. A possibility of low to moderate impacts to eligible properties exists depending on which launch facilities are selected. A file search of state site records failed to identify any historic sites in the vicinity of launch facilities. The study area has not been intensively surveyed and very little data are available; it is possible but unlikely that discoveries would be made during preconstruction clearance activities. At the site level, no launch facilities have been rated as having a high LOI, and only 5 are moderate. These ratings were based on their proximity to known NRHP sites or historic districts, in recognition of the potential that additional unrecorded resources may occur in the vicinity. Indirect impacts to nearby structures are also likely.

Deployment Area Roads. The nature of the proposed program (e.g., using only existing roads) virtually eliminates the possibility of impacts to structures such as buildings in areas outside of the base. Low and significant indirect impacts may occur as a result of increased visits to ghost towns, historic districts, and old mining communities on roads maintained year-round. Population growth would increase the number of construction personnel, tourists, and individuals seeking recreation who would encounter historic sites. Some portions of the proposed program area are more vulnerable than others: Utica, Vaughn, and Winifred, each with historic districts, are located near or along T/E routes. In addition, ghost towns and mining communities occur throughout the area between Winifred and Lewistown.

Evaluation of state bridge inventories revealed 152 bridges in the study area old enough to qualify for the NRHP. Twenty of these have been categorized as bridges scheduled for improvement; they are either too narrow or structurally unsound for HML use. These bridges require some type of upgrading and must, therefore, be evaluated for NRHP eligibility. Six of the bridges scheduled for improvement have either been repaired or upgraded since their original construction, which implies that their integrity has been damaged; they may no longer be considered eligible. Of the remaining 14 bridges, 8 are timber stringers, 5 are tee beam, and 1 is a steel girder and floor beam. Table 4.7.2-3 lists the six bridges potentially eligible for the NRHP and one which has already been determined to be eligible. At the site-specific level, moderate or high and significant impacts would occur to NRHP-eligible bridges. For example, the timber stringer bridge (P00009043+03091) on U.S. 287 in Teton County has been evaluated and found eligible for the NRHP. It is significant because it is the only bridge of this type in the state. It has been designated as a bridge scheduled for improvement because of its width, and it may be lacking in structural soundness. Upgrading would destroy its integrity; therefore, the impact would be high and significant.

Table 4.7.2-3

Bridges Potentially Eligible for the National Register of Historic Places

Bridge No.	Highway	County[1]	Feature Crossed	Type[2]	Date	Status[3]
L07561003+02001	CR561	CA	Shaw Canal, west of Simms	TBM	1934	2
P00060082+03731	US 87	CA	Southeast of Great Falls	TBM	1941	2
U05205000+04681	US 89	CA	Burlington Northern	TBM	1934	2
P00057082+02191	US 87	FG	Mill Ditch	TBM	1922	2
P00009043+01451	US 287	LC	North Fork Sun River, Northeast of Augusta	SGFB	1936	2
P00021002+06271	BR-I15	PD	Canal South of Conrad	TBM	1931	2
P00009043+03091	US 287	TT	Floweree Canal, northeast of Augusta	TS	1936	1

Notes: [1]CA = Cascade; FG = Fergus; LC = Lewis and Clark; PD = Pondera; TT = Teton.
[2]TBM = tee beam; TS = timber stringer; SGFB = steel girder floor beam.
[3]Status: 1 = Determined eligible for NRHP; 2 = Highest potential for eligibility.

Historic irrigation and canal systems, some of which date to the late nineteenth century, are concentrated primarily in Pondera, Teton, Cascade, and Wheatland counties, and would not be affected by the proposed program.

4.7.2.3 Native American Resources

Overall program impacts to Native American resources would be low and significant. With the exception of burials and burial grounds, the sometimes ephemeral aspect of sacred and ceremonial areas creates impacts of a different nature from those expected for more clearly defined historic, archaeological, and paleontological resources. The presence of non-Indian individuals, vandalism, or inadvertent disturbance can have a high and significant impact because the sacred aspect of the area could be irreversibly damaged.

Malmstrom Air Force Base. Impacts to Native American resources on Malmstrom AFB as a result of housing expansion and the HML vehicle operations training area are expected to be negligible regardless of which housing option is chosen. Malmstrom AFB was constructed in 1942, and it has been in continuous use as a military installation. No sacred or ceremonial areas have been identified onbase, and none are projected to

occur. The base does not have topographic attributes (e.g., buttes, springs, or rock outcrops) which would have been likely to attract Native American use for sacred or traditional purposes in the past.

Launch Facilities. Enlargement of the launch facilities and construction of HML enclosures is likely to affect sensitive areas, particularly on the west side of the deployment area where launch facility T-41 is within 2 miles of the Blackfeet Reservation. The proximity of this launch facility to the reservation increases the likelihood of encountering areas of more intensive sacred or traditional use. Launch facilities F-9 and D-9 are near burial grounds, and the potential exists for a high LOI. Figure 4.0-1 lists all launch facilities and shows the LOI expected. Overall impacts at launch facilities are expected to be low and significant. Most of the known sacred and traditional use areas are located near drainages or on high prominences and are not subject to program impacts.

Deployment Area Roads. Upgrading is planned only for existing roads and is not expected to go outside of the easement. The most likely sacred site type that might be affected is burials found during construction, and these would have been disturbed during the original construction. Consultation with Native American groups indicates that easements disturbed by previous construction are not of general concern as potential sacred areas.

4.7.2.4 Paleontological Resources

Overall program impacts to paleontological resources as a result of the Proposed Action would be moderate and significant. Internationally famous paleontological localities and formations occur within the Malmstrom AFB deployment area. Program impacts would affect the most famous formations in central Montana, the Two Medicine Formation and the Bear Gulch Limestone. Onbase construction activities, including possible base expansions, would produce negligible impacts. Launch facility construction impacts are expected to be moderate and significant. Upgrades of roads and bridges would cause moderate and significant impacts. Impacts to vertebrate fossils are considered significant, while impacts to geologic units containing only invertebrates are not considered significant.

Malmstrom Air Force Base. Impacts to paleontological resources on Malmstrom AFB as a result of housing expansion and the HML vehicle operations training area are predicted to be negligible regardless of which housing option is chosen. The base and proposed housing expansion area are located on Quaternary glacial till which usually does not contain fossils.

Launch Facilities. Some launch facilities are located on surface exposures of two or three geologic units. The LOIs for these launch facilities were assigned to the highest ranking level of sensitivity because of the potential disturbance of the geologic units ranked more sensitive. Sensitivity rankings for paleontology are explained more fully in Section 3.7.3.4. They are based upon geologic units and the fossils they contain. High rankings are given to those units containing numerous, important vertebrate fossils. Low rankings are given to units containing invertebrate fossils or no fossils. At launch facilities where additional expansion and impacts would occur, overall LOIs are predicted to be moderate and significant (Figure 4.0-1). One percent (2 launch facilities) occur on important fossil-bearing localities found in Zone 5 such as launch facility N-5, which occurs on the Bear Gulch Limestone of Mississippian age, or launch facility F-10, which occurs on the Willow Creek Anticline Locality of the Two Medicine Formation. Impacts to these localities would be high and significant (Figure 4.7.2-1). Under the Proposed Action, both launch facilities located on these deposits could be avoided.

The majority of launch facilities are located on important geologic units found in Zone 4 characterized by dispersed fossil distributions (50% or 100 launch facilities). Impacts to fossils within these units would be moderate and significant. Most Cretaceous Age geologic units containing important fossils fall within this category. This includes formations such as the Two Medicine Formation, the Judith River Formation, and the Kootenai Formation as well as Quaternary deposits. Localities within these formations contain concentrations of well preserved fossils but overall fossil distribution indicates that avoidance of important fossil localities is possible.

Launch facilities located on important geologic units with sparse distribution or those in Zone 3 comprise 3 percent (6 launch facilities) of the total. Impacts to these launch facilities are expected to be low and significant. One launch facility, S-40, is located on undifferentiated Tertiary sediments. These deposits may contain important vertebrates and are internationally famous for these fossils just east and south of the ROI. Five launch facilities (G-7, G-8, P-4, P-5, P-8) are situated on the Telegraph Creek Formation. Mammals and reptiles are occasionally found in this formation.

Geologic units containing invertebrate fossils or those in Zone 2 comprise 46 percent (91 launch facilities) of the total launch facilities. Most of these launch facilities are in the western portion of the deployment area. Fossil-bearing formations within the low impact category include invertebrate fossils such as those found in Mississippian, Pennsylvanian, and Cambrian units. These resources are generally of low research potential. Overall impacts may, therefore, range from low and not significant to moderate and significant depending upon which launch facilities are selected.

One launch facility is located on volcanics and tuffs with no known fossils. This launch facility (F-2) is in Zone 1.

Deployment Area. Additional impacts in the deployment area would occur in road upgrade segments, bridge upgrades, and aggregate source areas (Figure 4.0-2). Road upgrade impacts to paleontological resources are expected to be moderate and significant. Fifty-four percent of all proposed T/E route improvements are located on Zone 4 areas or those important geologic units containing vertebrate fossils (Table 4.7.2-4). Geologic units in Zones 2 and 3 with invertebrate fossils or sparse vertebrate fossils comprise 44 percent of the proposed road improvements. Impacts in these areas would be low and not significant. Areas of negligible impacts or those in Zone 1 account for 1 percent. High and significant impacts would occur on 1 percent of the road segments because these cross areas in Zone 5, which are important fossil-bearing localities with abundant fossils. Five of the nine affected counties (Fergus, Judith Basin, Lewis and Clark, Teton, and Wheatland) would have moderate and significant impacts, while the remaining four counties (Cascade, Chouteau, Pondera, and Toole) would have low and not significant impacts due to road construction.

Impacts to paleontological resources differ from those of archaeological resources, particularly in scale and context. The scale of paleontological resources is larger and deeper than those of archaeological resources. Impacts due to road upgrades may completely eliminate an archaeological site. The same size impact may expose and only partially destroy fossils. The context of these resources also differs due to size. Fine or microscopic context describes archaeological resources while larger context is found in paleontological areas.

Bridge upgrades are expected to have moderate and significant impacts for paleontological resources due to their location on Quaternary alluvium which may contain important

Table 4.7.2-4

Distribution of Transporter/Erector Road Areas in Paleontology Sensitivity Zones

County	Percent of T/E Road Areas Zone 5 (High)	Zone 4 (Moderate)	Zones 2,3 (Low)	Zone 1 (Negligible)	Total
Cascade		12.0	88.0		100.0
Chouteau		14.0	86.0		100.0
Fergus		77.0	23.0		100.0
Judith Basin		69.0	31.0		100.0
Lewis and Clark		70.0	12.0	18.0	100.0
Pondera		6.0	93.0		100.0
Teton	4.0	48.5	47.5		100.0
Toole			100.0		100.0
Wheatland		100.0			100.0
All Counties	1.0	54.0	44.0	1.0	100.0

vertebrate fossils. Impacts caused by detours around 33 bridges scheduled for improvement may be moderate and significant. All except two near Conrad are on Quaternary alluvium which may contain vertebrate fossils. The two detours near Conrad are on Colorado Shale of Cretaceous age where impacts would be low and not significant.

Impacts from use of aggregate sources are considered indirect and could cause moderate and significant impacts to paleontological resources. Specific aggregate source areas have not been chosen; however, most possible source areas occur within Quaternary terrace gravels and alluvium. These units are known to contain a sparse distribution of Pleistocene and recent age mammals which may be avoided because of the sparse fossil distribution.

4.7.3 Impacts of Alternatives

A comparison of alternatives reveals similarities in the LOI projected for each of the elements. Overall program impacts are lowest for Alternative 1, which is rated low but significant for all four elements. Alternative 2 is ranked slightly higher than Alternative 1, but the LOI is still predicted to be low and significant with the exception of paleontological Resources, which is expected to be moderate. The greatest impact would occur for Alternative 3 for all elements, with a range from low and significant to high and significant. Among the elements, site-specific impacts at launch facilities range from low to high depending upon the density and sensitivity of resources, and the possibility of avoidance.

4.7.3.1 Prehistoric Resources

Alternative 1. This alternative requires fewer acres for housing expansion. About 230 acres would be acquired. However, no prehistoric sites were identified in this area during a recent survey. Site-specific impacts would range from negligible at the north to low and significant in the HML vehicle operation training area to the south and east. Overall impacts for Malmstrom AFB under this alternative would be low and significant. The LOI and significance ratings for disturbance at the launch facilities, along road and bridge upgrades, and near aggregate sources are identical to the Proposed Action.

Alternative 2. This alternative involves an increase in the acreage required for housing expansion on Malmstrom AFB. Approximately 380 acres would be acquired but site-level impacts in that area would be negligible. Overall impacts would be low and significant. The number of launch facilities would increase from 100 to 125, creating an increase in land acquisition for expansion from 300 to 375 acres. If all 38 launch facilities in high sensitivity zones are selected, impacts would be moderate and significant because the cumulative percentage would be 30.4 percent. If none of the 38 launch facilities are selected, impacts would be low and significant. Impacts for launch facilities would range from moderate to low and significant. The LOI and significance ratings for disturbance along road and bridge upgrades and near aggregate sources are identical to the Proposed Action.

Alternative 3. This alternative doubles the number of launch facilities from 100 to 200 but decreases expansion acreage from 3 acres to 2 acres for each launch facility. Because all 200 launch facilities would be used, the 38 launch facilities located in high sensitivity zones cannot be avoided as they can in the Proposed Action and other alternatives. More site-level impacts may be higher than in the Proposed Action but the number of launch facilities occurring in high sensitivity areas is only 19 percent of the total (Table 4.7.2-1). Although effects are likely to be somewhat higher than the Proposed Action and other alternatives, overall impacts are still estimated to be low and significant. The LOI and significance ratings for disturbance at Malmstrom AFB and from road and bridge construction are identical to the Proposed Action.

4.7.3.2 Historic and Architectural Resources

Alternative 1. The impacts for this alternative would be the same as the Proposed Action. As discussed in Section 4.7.3.1, some impacts (e.g., bridge upgrading and enlargement of launch facilities) would occur no matter which alternative is chosen, but it is possible to avoid all projected sensitive areas in the proposed program area.

Alternative 2. Impacts with this alternative would be slightly higher than Alternative 1, but are still considered low and significant.

Alternative 3. Impacts with this alternative would be the highest of the three, but because expected impacts to historic and architectural resources are generally expected to be low, they are still regarded as low but significant for the overall program.

4.7.3.3 Native American Resources

Alternative 1. Impacts are expected to be low and significant with this alternative, the same as for the Proposed Action.

Alternative 2. Higher impacts to Native American resources would occur with this alternative but the impacts are still considered low and significant.

Alternative 3. Impacts would be highest with this alternative. Because all launch facilities would be used, high impacts would occur at launch facilities D-9 and F-9 near burial grounds, and at T-41 near sacred and traditional use areas. Overall impacts would be moderate and significant if these areas are affected.

4.7.3.4 Paleontological Resources

Alternative 1. Impacts to paleontological resources under this alternative (placement of 200 HMLs at 100 launch facilities) are identical to those projected for the Proposed Action. Areas with the highest sensitivity rating (Zone 5), or unique fossil localities with dense remains, may be avoided under this alternative.

Alternative 2. Impacts under Alternative 2 (250 HMLs at 125 launch facilities) would also result in moderate and significant impacts. Under this alternative, all or some of the launch facilities and T/E routes located on important vertebrate fossil-bearing units or those in Zone 4 would be affected. Avoidance of Zone 5 areas with the highest paleontology sensitivity rankings may be possible under this alternative.

Alternative 3. This alternative (200 HMLs at 200 launch facilities) represents the worst alternative for paleontological resources. All launch facilities would be affected, including those located on Zone 5, where impacts are rated high and significant. Avoidance of any launch facility is not possible, but most impacts would occur on launch facilities or T/E routes on Zone 4 (geologic units with important vertebrate fossils with dispersed distribution). Therefore, impacts under this alternative would be moderate and significant.

4.7.4 Cumulative Impacts

4.7.4.1 Prehistoric Resources

If the Peacekeeper in Rail Garrison basing mode is implemented simultaneously with the Proposed Action, 360 acres would be acquired for programmed housing and additional facilities and rail lines would be constructed southeast of the existing flightline. Disturbance to prehistoric resources may occur during construction of housing and facilities resulting in loss of site integrity or destruction of the resource.

Approximately 360 acres for housing would be acquired north of the base in sensitivity Zone 4. This is an increase of 30 acres over the Proposed Action. Because the area has been surveyed and no sites are found, site-specific impacts will be negligible. Additional facilities for the Peacekeeper in Rail Garrison basing mode would be located southeast of the existing flightline in sensitivity Zone 2. Therefore, overall impacts at Malmstrom AFB for both programs are projected to be low and significant.

4.7.4.2 Historic and Architectural Resources

No perceptible increase in cumulative impacts to these resources is expected if the Peacekeeper in Rail Garrison program is implemented along with the Proposed Action, since most of the additional activities would be confined to the Malmstrom AFB.

4.7.4.3 Native American Resources

No perceptible increase in cumulative impacts to these resources is expected if the Peacekeeper in Rail Garrison program is implemented along with the Proposed Action.

4.7.4.4 Paleontological Resources

If the Peacekeeper in Rail Garrison basing mode is implemented along with the Proposed Action, impacts to paleontological resources would not change. Malmstrom AFB and surrounding areas occur on Quaternary glacial till, which usually does not contain fossils.

4.7.5 Impacts of the No Action Alternative

Under the No Action Alternative, impacts to cultural and paleontological resources will occur only as a result of currently authorized missions and ongoing nonprogram-related processes. At Malmstrom AFB, non-Small ICBM facility construction or expansion may affect areas not yet heavily disturbed. In the deployment area, some resource loss will result from natural erosion, but greater impacts will occur where human activities accelerate the natural processes. Deforestation and intensive cultivation of agricultural land are two such activities which will continue to contribute to resource loss. Vandalism and private artifact collecting activities will also continue to affect the resource base.

4.7.6 Potential Mitigation Measures

Mitigations are measures that can be undertaken to reduce adverse effects to cultural properties. The measures described in the PA (Appendix B.2), and in Section 4.7.1.4 will be effective in reducing the disturbance of cultural resources and reducing the information lost from those resources which are affected. Some or all of the steps listed therein may be implemented as the need arises. Additional mitigation measures for cultural and paleontological resources will be identified in the Cultural Resource Management Plan to be developed for the deployment area. Examples are listed in the following, along with the agencies that may be involved in their implementation.

- Consult with appropriate Native American groups and local authorities if burials are discovered during construction. If the burial can be identified with contemporary tribal groups, reburial would be accomplished in accordance with tribal customs and desires. If it is not, reburial would be accomplished in accord with state or local laws (U.S. Air Force).

- Provide for professional archaeologists to monitor ground-disturbing activities during construction (U.S. Air Force and contractors).

- Stabilize structures to reestablish weather resistance and stability (U.S. Air Force and contractors).

- Preserve in place (U.S. Air Force and contractors).

- Rehabilitate historic structures by repainting or repairing (U.S. Air Force and contractors).

- Evaluate and treat paleontological sites in consultation with the SHPO and the state paleontological consultant on a case-by-case basis (U.S. Air Force).

4.7.7 Irreversible and Irretrievable Resource Commitments

The cultural and paleontological resource bases are fragile, finite, and nonrenewable. Physical disturbances of any kind will result, to some degree, in an irreversible and irretrievable commitment (e.g., loss) of resources. The importance of any given resource is closely related to its structural and/or depositional integrity. Once a site is disturbed, it may be stabilized and protected from further deterioration, but it cannot be repaired to its original condition. Even the application of data recovery techniques involves some loss because data recovery is necessarily selective.

4.7.8 Relationship Between the Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Effects of the proposed program are likely to increase the loss of cultural and paleontological resources beyond the conditions which could be expected without the program. However, program-related field studies and analyses would contribute to the present level of knowledge about resources in north-central Montana. The information resulting from the loss of some sites should be useful in future efforts to manage the remaining resources. It is anticipated that the number of cultural and paleontological resources lost without the benefit of some form of data recovery would be small; the resulting loss of productivity in the north-central Montana region as a whole should be slight.

4.8 Biological Resources and Threatened and Endangered Species

The proposed program would affect biological resources primarily through surface disturbance at Malmstrom Air Force Base (AFB) and in the deployment area. Indirect impacts from increased recreational activities could also occur. The impact analysis process for biological resources addresses vegetation, wildlife, aquatic habitats, unique and sensitive habitats, and threatened and endangered species.

4.8.1 Impact Analysis Methodology

The impact analysis methodology for biological resources and threatened and endangered species involved three separate procedures: evaluation of program impacts, determination of levels of impact (LOI), and determination of the significance of impacts. The methodology also included consideration of a number of assumptions and assumed mitigations. Impacts were evaluated at the site level and an overall collective assessment was made for each resource element. Site level impacts were evaluated at Malmstrom AFB, launch facilities, and other areas that may be directly disturbed near roads and bridges. Indirect impacts associated with increased recreational use were also assessed. The overall assessments place site impacts in the perspective of the importance of these accumulated impacts within the entire program study area. These overall assessments were strongly influenced by individual sites that would receive biologically important impacts (e.g., loss of threatened and endangered species habitat or degradation of fisheries habitat). Impacts to threatened and endangered species also have importance at the state and national levels.

4.8.1.1 Evaluation of Program Impacts

Vegetation. Major vegetation types and land cover types were mapped within 1,000-foot corridors along transporter/erector (T/E) routes and access roads, and within 207-acre blocks randomly placed around launch facilities using aerial photographs and existing vegetation maps as discussed in Section 3.8.2.2. The data were incorporated into a computerized Geographic Information System (GIS) to facilitate analysis. Relative abundance of these types was measured within smaller 100-foot corridors along T/E routes, 1,000-foot corridors along access roads, and within 207-acre blocks surrounding launch facilities. Areas of potential surface disturbance were assumed to occur within these sampled units. Because the roadside area that would potentially be disturbed is narrow (less than 20 ft wide) and exceeds the resolution and scale used for vegetation mapping, it was necessary to sample the wider roadside area previously discussed. Therefore, the amount of each vegetation type that would be disturbed was assumed to be proportional to the area occupied by that vegetation type in the sampled corridor. For example, if foothills prairie occupies 27 percent of the transect, it was assumed that 27 percent of the area to be disturbed would be foothills prairie. The amount of each vegetation type found in a 207-acre block area surrounding each launch facility was also calculated. Again, the area of each vegetation type that would be disturbed at a launch facility was assumed to be proportional to the area occupied by that type in the sampled unit.

The locations and amounts of potential offsite disturbance were also considered. The analysis considered effects of erosion, siltation, dust, and excess water or water loss. The intensity of the disturbance, the duration of the disturbance as a result of program-related activities, and the persistence of the disturbance because of inherent plant community characteristics (such as recovery potential) were also estimated. The expected effectiveness of and procedures for revegetation in each vegetation type were

identified and factored into the impact assessment. Potential impacts that may result from indirect program-related activities, such as increased recreational use and program-induced development elsewhere in the Region of Influence (ROI), were also addressed.

Wildlife. Direct impacts to wildlife in the deployment area were determined by estimating the overlap between the ranges of wildlife species (particularly big game species) and construction areas at Malmstrom AFB, launch facilities, and T/E routes. Areas where aggregate resources may be developed were also evaluated. Potential disturbances to wildlife include interference with behavior (e.g., migration, feeding, and daily movement) or reproduction. The type of disturbance (e.g., loss of habitat, displacement, loss of food sources, or mortality) was evaluated for both game and nongame species and, where possible, the severity of the disturbance was noted. Wintering habitat is of particular importance to the survival of big game; therefore, emphasis was placed on evaluating impacts to these habitats.

The percentage of wintering habitat lost was compared with the total wintering habitat located in the deployment area. This analysis was applied to big game species, which are of special concern to federal and state wildlife agencies and the general public. Where available, density and distribution data were used in the analysis to determine what impacts can be expected for other game species and where impacts would be concentrated (e.g., at Malmstrom AFB, along T/E routes, or near launch facilities).

Disturbance to nongame species was addressed in a different manner. Distribution and density data were unavailable for nongame species and impacts were evaluated based on the diversity of nongame communities that may be affected. Diversity was used to characterize the nongame communities because it is an indicator of the numbers and types of species found in the ROI and suggests the complexity of ecological relationships that may be affected by the program. Potential indirect impacts to both game and nongame species were addressed by comparing species distributions with those areas that would receive increased recreational use. Species that are particularly susceptible to disturbance were noted.

Aquatic Habitats. Aquatic habitats can be directly affected by program-related construction and operations. Streams, lakes, and other wetlands were identified along T/E routes, access roads, launch facilities, and at Malmstrom AFB. These aquatic habitats were considered in the impact analysis if they were likely to be affected by road upgrades, bridge replacement, or proposed launch facility construction. Operations impacts are expected to be very low, but habitats that may be affected (e.g., those near the off-road Hard Mobile Launcher [HML] vehicle operations training area at Malmstrom AFB) were also considered. Potential impacts at each site were quantified to the degree possible based on the area lost to landfill operations, areas modified by activities such as channelization or bridge construction, areas that may receive program-generated sedimentation, areas where aquatic productivity may be reduced, and areas where important aquatic biota may be threatened (e.g., through creation of barriers to fish migration in streams). The degree of impact expected at each site was determined relative to the intrinsic value of the habitat as determined in the baseline analysis. This analysis incorporated data from the Montana Department of Fish, Wildlife and Parks fisheries data base, agency and literature resources, and field observation. Final summarization placed these potential impacts in the perspective of local, regional, and national concern.

Secondary activities related to the proposed program (examples are increased recreational use of aquatic habitats and population-induced housing construction) may

also disturb aquatic habitats. Analysis of these potential impacts relied heavily on projections of increased use and locations supplied by the socioeconomics and recreation resources. Comments and concerns of natural resource management agencies were incorporated to arrive at an overall rating of significance.

Unique and Sensitive Habitats. Habitats that may be disturbed by the program were identified. These potential disturbances were qualified with respect to the amount of habitat lost, recovery time, effects on continued existence of the habitat in its present state, disruption of the present function of the habitat, and the local, regional, and national importance of any habitat loss. These impacts were quantified when possible, but also relied on qualitative evaluation because different types of habitats (e.g., wetlands, game preserves, and mountain grasslands) must be compared.

Information supplied by the socioeconomics and recreation resources was used to determine the likelihood that program-induced population growth would result in disturbance or enhancement of unique and sensitive habitats. Determination of impacts in these respective habitats relied on interviews with natural resource management agencies and personal observation of habitat conditions. These impacts were ranked qualitatively and combined with the results of the direct impact analysis to produce an overall significance rating.

Threatened and Endangered Species. Impacts to threatened and endangered species were determined for all federally listed, proposed, candidate, and Montana-recognized species likely to be affected by the proposed program. Emphasis was placed on species located within the areas of direct surface disturbance that have the greatest potential for being disturbed by program activities. A biological assessment of potential impacts to the federally listed bald eagle, peregrine falcon, grizzly bear, gray wolf, and black-footed ferret was prepared for the U.S. Fish and Wildlife Service (USFWS) in response to their request during Section 7 consultation. Results of the biological assessment and the USFWS response is discussed under Section 4.8.2.5. Locations of other threatened and endangered sensitive species and critical habitats were also compared to proposed locations of program construction and operations activities to evaluate which species may be directly affected. Specific program activities were analyzed to determine what impacts, if any, would occur, and whether the species disturbed are federally listed, proposed, candidate, or Montana-recognized. Types of impacts evaluated included direct mortality, displacement, loss of habitat or habitat component, noise pollution, disturbance of daily/seasonal movements or activities, and stress. Field surveys would be conducted during the spring and summer of 1987 for 12 plants (see Section 3.8.3.5) and 2 animals (the bald eagle and grizzly bear). Sensitive species occurring elsewhere in the ROI were also addressed. Impacts to these species would result from population growth and increased recreational use.

4.8.1.2 Determination of Levels of Impact

The expected overall impact to each biological resources element (vegetation, wildlife, aquatic habitats, unique and sensitive habitats, and threatened and endangered species) was determined to be negligible, low, moderate, or high. The LOI represents the biological magnitude of the expected disturbances; that is, the effect on the condition of populations, habitats, and ecological systems. The LOIs are defined as the following:

- Negligible Impact -- No impact is expected, or the impact is expected to be so small as to be essentially unnoticeable.

- Low Impact -- The impact is noticeable, but no meaningful adverse consequences are expected for the condition of populations and habitats and integrity of ecological systems.

- Moderate Impact -- The proposed program begins to adversely affect the condition of populations and habitats and integrity of ecological systems.

- High Impact -- The proposed program has a substantial adverse effect on the condition of populations and habitats and integrity of ecological systems.

The factors used in determining the LOI for each element are described in the following sections.

Vegetation. The LOI determination was based on the quantity and type of vegetation expected to be affected:

- Number of acres disturbed by program construction or operations, considering the types of vegetation affected and their abundance in the region;

- Severity of the disturbance (i.e., whether clearing, severe disturbance, or minor disturbance is involved); and

- Potential for program-indirect impacts to vegetation as a function of population increases in the ROI.

Wildlife. The LOI determination was based on the quantity of game and nongame habitat expected to be disturbed, and the expected degree of displacement and reduction of wildlife populations:

- Approximate area of year-long game habitat disturbed, considering the abundance of the habitat type in the deployment area;
- Approximate area of seasonally important game habitat disturbed, considering the abundance of the habitat type in the deployment area;
- The extent to which an important habitat component (feeding, nesting, breeding, cover, and water) is lost;
- Approximate areas and species diversity of nongame habitats disturbed, considering the abundance of the habitat type in the deployment area;
- Expected degree of displacement or reduction of wildlife populations; and
- Increased hunting/poaching of game species, as a function of expected human population increases in the deployment area and ROI.

Aquatic Habitats. The LOI determination was based on the quantity of both wetlands and fish habitat potentially affected, and the expected increase in use of aquatic habitats in the ROI:

- Area of wetland habitat expected to be directly affected, considering the abundance of wetlands in the ROI;

- Area and/or length of fish habitats that have the potential to be directly affected, considering abundance of such habitats in the ROI;

- Number of fish (sport, native, and forage) species potentially affected; and
- Expected increase in use of aquatic habitats as a function of population increases in the ROI.

Unique and Sensitive Habitats. The LOI determination was based on the number of habitats that have the potential to be directly affected and the expected increase in use of habitats in the ROI:

- Number and area of unique and sensitive habitats expected to be directly affected, considering the abundance of such habitats in the ROI; and
- Expected increase in use of unique and sensitive habitats as a function of population increases in the ROI.

Threatened and Endangered Species. The LOI determination was based on the number of federally listed, federal-proposed/candidate, and Montana-recognized species potentially affected, and the estimated potential for impact to designated critical habitats:

- The number of federally listed, federal-proposed/candidate, and Montana-recognized species expected to be directly or indirectly affected, and the expected severity of the effects;
- The extent to which the distribution of a potentially affected species is restricted to the direct or indirect impact area;
- The extent to which designated critical habitat is expected to be affected; and
- The extent to which an important habitat component (feeding, nesting, breeding, wintering, water, and cover) is lost.

In determining the LOI for threatened and endangered species, those occurring in the areas of direct surface disturbance were projected to receive greater impacts than those occurring in indirect impact areas. In addition, potential impacts to federally listed species and species proposed for federal listing were weighed more heavily than impacts to federal-candidate species, which were in turn weighed more heavily than impacts to Montana-recognized species. This hierarchy among various categories reflects the degree of endangerment of the protected species.

These factors were evaluated for each element using the data and analyses described in Sections 3.8.2 and 4.8.1.1. These evaluations were then synthesized to assess the overall potential for the proposed program to affect the biological status of each element. An LOI was then assigned for each element as previously described. The LOI was determined for both short- and long-duration impacts. A short-duration impact is defined as a transitory impact from which the resource would essentially recover within 5 years after the end of construction. Long-duration impacts would persist for more than 5 years after the end of construction, or result from long-duration operations. Operations are not expected to have any transitory (short-duration) impacts because disturbance from operations would occur repeatedly over a long period.

4.8.1.3 Determination of Significance

The significance of biological resources and threatened and endangered species impacts were evaluated in accordance with Council on Environmental Quality (CEQ) regulations.

Significance was assessed through evaluation of the context and intensity of the impacts. Context includes consideration of the settings (site, local, or regional) and the duration of the impacts. The CEQ regulations provide ten items that should be considered in evaluating intensity. Of these ten items, the following are applicable to the biological resources and threatened and endangered species:

- The degree to which the proposed action affects public health or safety;

- Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas;

- The degree to which the effects on the quality of the human environment are likely to be highly controversial;

- The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration;

- Whether the action is related to other actions with individually insignificant but cumulatively significant impacts;

- The degree to which the action may adversely affect an endangered or threatened species or its habitat that has been determined to be critical under the Endangered Species Act of 1973; and

- Whether the action threatens a violation of Federal, State, or local law or requirements imposed for the protection of the environment.

For biological resources impacts, the concepts of intensity and context are embodied in an evaluation of the wider ecological and social importance of an impact at the local, regional, or national level. The wider ecological importance for an impact refers to its potential to affect a wider array of biological resources that are ecologically related to the directly affected resources. The social importance of a biological impact refers to its potential to affect the scientific, recreational, economic, or aesthetic value of the resource. This potential is reflected to a large extent in the level of concern an impact elicits from natural resource management agencies and scientific authorities.

All impacts to biological resources elements were determined to be significant or not significant based on an assessment of their wider ecological and social importance. The following primary factors were considered in determining the significance of all elements:

- Uniqueness; ecological, scientific, recreational, or economic value; current level of disturbance of affected resource; and resulting level of concern the impacts would be expected to elicit from natural resource management agencies or scientific authorities;

- The extent to which the proposed program will add to present or future disturbances of resources in the ROI; and

- Potential to recover through natural population or habitat recovery or through artificial means such as revegetation and stream restoration.

An additional factor considered in determining significance for aquatic habitats is the perceived sensitivity of the habitat as indicated by its degree of protection or management. A factor considered in determining significance for unique and sensitive habitats is the type or classification assigned to it (e.g., wilderness areas, research natural areas, and designated natural areas) and the degree of sensitivity indicated by that classification.

For threatened and endangered species, the likelihood that the proposed program would pose a threat to the continued existence of threatened and endangered species was also used in determining significance.

These factors, derived from the ten indicators of intensity contained in the CEQ guidelines, were evaluated to determine whether the ecological and social effects are sufficient to warrant the impact being rated as significant. This determination included an estimate of whether the expected impacts are of sufficient concern to be considered significant by natural resource management agencies and scientific authorities.

4.8.1.4 Assumptions and Assumed Mitigations

The analysis of impacts to biological resources and threatened and endangered species includes consideration of two types of mitigation measures: (1) assumed mitigations, representing standard sound construction practices and prudent planning, which the biological impact analysis assumes would be implemented to reduce impacts; and (2) proposed mitigations (Section 4.8.6), which are additional measures that could entail significant program changes or expenditures of resources or efforts, which if implemented, would be practical and effective in further reducing impacts.

The following assumed mitigations were used in the assessment of biological resources impacts:

- Disturbance of native vegetation, aquatic habitats, and other identified sensitive habitats would be reduced to the extent possible through the use of sound construction practices and avoidance on a local basis (through the site-selection process and placement of onsite structures). Area limitations for construction activities would be established and enforced to minimize habitat disturbance.

- Measures would be taken to minimize noise, dust, erosion, and sediment runoff into water bodies.

- Short-term soil stabilization using accepted soil protection techniques and quick-growing native species and long-term revegetation with native plants would be carried out wherever appropriate.

- Removal of trees and raptor nests/roosts would be minimized.

- New bridge and culvert upgrades and other intrusions into aquatic habitats would be designed to minimize short-duration disturbances (e.g., sedimentation, landfill, removal of riparian vegetation, and discharge of construction materials or fuels) from construction activities and to avoid long-duration disturbances (e.g., bridge or culvert design that forms a barrier to fish movement, permanent removal of sensitive habitats due to filling, and permanent clearing of riparian habitat).

- Conduct timely on-the-ground surveys of construction and aggregate sites to ensure these areas do not fall within 0.25 mile of bald eagle or peregrine falcon nests. If construction activities must take place within 0.25 mile of nest sites, these activities would be scheduled to avoid biologically critical periods.

- Construction and aggregate mining activities occurring within 1 mile of grizzly bear spring habitats and denning sites or within 0.25 mile of gray wolf denning sites would be scheduled to avoid biologically critical periods.

- Black-footed ferret surveys would be conducted for areas immediately surrounding aggregate sites and potential construction areas if prairie dog colonies are encountered during program activities. If black-footed ferrets are located, the Air Force will immediately coordinate activities with the USFWS.

- Surveys will be conducted of the potential habitats of one federal-candidate and ten Montana-recognized plant species and the results incorporated in early planning and siting processes to avoid disturbance to these species.

4.8.2 Impacts of the Proposed Action

Short-duration construction impacts to biological resources and threatened and endangered species are expected to occur. In some instances, long-duration impacts may occur. Short- and long-duration impacts from operations would generally be very minor. Increased program-induced population growth would create a greater demand on biological resources (e.g., hunting, fishing, and other recreational activities) in the Great Falls area. Potential overall program-related short- and long-duration impacts (i.e., those impacts resulting from construction, operations, and indirect sources) to vegetation, wildlife, and threatened and endangered species would be low and not significant. Overall short-duration impacts to aquatic habitats would be moderate, and overall long-duration impacts are expected to be low. Short- and long-duration impacts to aquatic habitats would not be significant. In addition, overall short- and long-duration impacts to unique and sensitive habitats would be negligible (Figures 4.0-1 and 4.8.2-1). Selection of either Housing Option H1 or H2 would have little effect on these conclusions; therefore, no further discussion of these options is provided.

4.8.2.1 Vegetation

For the Proposed Action, overall short- and long-duration impacts to vegetation would be low and not significant. Short- and long-duration disturbance to vegetation as a result of earth-moving activity during construction of new facilities, roads, and bridges would occur. Approximately 3 acres of vegetation would be removed during construction of new facilities at each of 100 launch facilities. Short-duration disturbances including crushing and mortality of plants, soil compaction, and some soil erosion would occur in areas where off-road construction and support vehicles would travel. Dust pollution from these activities may adversely affect the growth of sensitive plant species in surrounding areas. Long-duration impacts to vegetation include destruction of plants and plant cover, destruction of soil structure, soil compaction, decreased water infiltration rates, and accelerated soil erosion. Long-duration disturbance is expected in the HML vehicle operations training area due to repeated off-road passes of the HML under a wide range of weather conditions. This activity would result in crushing and breaking of plants, removing roots from substrate, burying plants, and adverse soil impacts as previously

BIOLOGICAL RESOURCES AND THREATENED AND ENDANGERED SPECIES

ELEMENT	NUMBER OF LAUNCH FACILITIES													
	SHORT DURATION							LONG DURATION						
	NOT SIGNIFICANT				SIGNIFICANT			NOT SIGNIFICANT				SIGNIFICANT		
	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH
VEGETATION	106	57			37			106	80			14		
WILDLIFE	125	38	37					124	76					
AQUATIC HABITATS	150	32	4	1	10	1	2	182	13	2		3		
UNIQUE AND SENSITIVE HABITATS	200							200						
THREATENED AND ENDANGERED SPECIES	172	22			5		1	172	22			5		1

Note: Figure 4.0-1 shows the LOI and significance ratings for each launch facility.

Note: Site impacts at individual launch facilities are illustrated in Figure 4.0-1.

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FIGURE 4.8.2-1 SUMMARY OF SITE IMPACTS TO BIOLOGICAL RESOURCES AND THREATENED AND ENDANGERED SPECIES ASSOCIATED WITH PROPOSED SMALL ICBM CONSTRUCTION AND OPERATIONS AT LAUNCH FACILITIES IN MONTANA

discussed. The degree of disturbance would vary depending on the frequency, intensity, and season of travel, soil and vegetation type, and recovery potential of the site. Disturbance to vegetation in the deployment area during the operations phase is expected to be minimal.

Loss of onbase vegetation is expected to result from construction of new facilities and housing units, development of the HML training area and associated facilities, and development of utility and transportation corridors. A total of 321 acres of vegetation would be temporarily disturbed and a total of 840 acres would be permanently lost onbase. Much of the vegetation likely to be disturbed onbase would be a grassland type comprised of a mixture of introduced and native grasses (Section 3.8.3.1). Construction of facilities in the HML training area, and construction of simulated T/E and access roads, would likely result in the long-duration loss of vegetation in 20 percent of the 600 acres of the HML training area, while off-road vehicle training for HML drivers would repeatedly disturb the remainder of the area over the duration of the program.

Disturbance to vegetation in the deployment area, including destruction of plant cover, crushing of plants, and soil compaction, is expected to result from road and bridge upgrading and development of program-related facilities at the Minuteman launch facilities. Much of the area expected to be affected for road widening has been previously disturbed during original road construction or during road maintenance. Many of the vegetation types in the deployment area (Table 4.8.2-1) have moderate to good potential for recovery from disturbance with application of appropriate revegetation techniques. Revegetation measures are also expected to substantially reduce the potential for establishment and the spread of noxious weeds on disturbed sites. Approximately 880 acres of vegetation are expected to be temporarily disturbed and 228 acres of vegetation permanently disturbed along T/E route corridors and 140 acres temporarily disturbed and 160 acres permanently lost around launch facilities.

The largest acreage of sensitive vegetation types (riparian and forest vegetation types) that occur in areas of direct surface disturbance are found in Cascade and Fergus counties; the largest acreage of native grassland in areas of direct disturbance is also most common in Cascade and Fergus counties, and Fergus and Pondera counties contain the majority of agricultural lands in areas of direct surface disturbance. Fourteen launch facilities (A-5, A-6, A-8, B-10, B-11, C-8, C-9, C-10, E-8, E-10, M-2, N-4, N-6, and O-9) are located near forest or riparian types that would require long-duration recovery periods if disturbed. Fifty-seven launch facilities have at least 25 percent of the vegetation within 500 feet of the launch facility dominated by native grassland.

Table 4.8.2-1 lists approximate acreages of major vegetation types and general mapping categories expected to be disturbed during construction. These amounts are based on relative abundance along the T/E routes, access roads, and around the launch facilities. Impacts at launch facilities and along T/E routes are presented in Figures 4.0-1 and 4.0-2. One hundred and six facilities would have short-duration, negligible impacts and 57 would have short-duration, low, and not significant impacts. If selected for deployment, vegetation at 37 launch facilities would receive short-duration, low, and significant site impacts, but vegetation at only 14 launch facilities would receive long-duration, low, and significant site impacts (Figure 4.8.2-1). Long-duration, negligible, site impacts would occur at 106 launch facilities, and 80 launch facilities would have long-duration, low, and not significant site impacts. Although a range of long-duration, negligible to low and significant site impacts may occur depending on which silos are selected, the accumulated impacts from disturbances onbase, along T/E routes, and at launch facilities would result in approximately the same overall LOI.

Table 4.8.2-1

Existing Land Cover Categories (Including Major Vegetation Types) by Percentage Composition in Potential Disturbance Zones

Mapped Categories	Potential Disturbance Zones		
	T/E Routes (100-ft Corridor) (%)	Access Roads (1,000-ft Corridor) (%)	Launch Facilities (207-Acre Block) (%)
Native grassland	32	35	35
Forested land	4	2	2
Riparian vegetation	2	2	2
Inland saline flats	<1	<1	<1
Agricultural land	62	60	60
Maintained grassland	<1	<1	<1
Urban/disturbed	<1	<1	<1
Mineral extraction	<1	<1	<1
Water	<1	<1	<1

The small area expected to be disturbed during construction and operations, the anticipated minor loss of biological productivity and habitat, implementation of the appropriate assumed mitigations, and the fact that much of this area has been previously disturbed result in short- and long-duration, low impacts to vegetation. The relatively small amount of native vegetation that would be disturbed by the proposed program is not likely to generate substantial concern among natural resource management agencies or scientific authorities. A considerable amount of native vegetation has been disturbed in the region; therefore, the small amount of new area potentially disturbed by the program would result in a cumulatively not significant impact. These factors, in addition to the relatively good recovery potential of many of the sites, application of appropriate mitigation measures to reduce vegetation impacts, and the minor concern expected, indicate that overall short- and long-duration impacts to vegetation would not be significant.

4.8.2.2 Wildlife

Short- and long-duration impacts to wildlife as a result of the Proposed Action would be low and not significant. Construction activities at Malmstrom AFB and in the deployment area would cause minor short-duration disturbances, including disruption of

daily/seasonal activities, displacement, and increased stress during critical periods (e.g., times of reproduction), to various wildlife species and their associated habitats. This potential disturbance would result from increased human activity, traffic, and noise at construction sites. Major big game species of concern in the deployment area include mule deer, white-tailed deer, pronghorn, elk, and black bear. Onbase construction activities are not expected to affect any big game species; however, nongame species would receive some minimal impacts. Minor long-duration effects would result from habitat loss, operations (which would cause some disruption of daily/seasonal activities, displacement, and increased stress), and increased hunting pressure as a result of program-induced population growth.

No big game species are known to occur on Malmstrom AFB; however, small game and nongame species onbase would be affected by habitat loss resulting from construction of new facilities, development of the HML vehicle operations training area, and development of utility and transportation corridors. Short-duration disturbance of wildlife habitat from physical disruption would include approximately 321 acres associated with construction of new buildings onbase and long-duration disturbance onbase would result in the permanent loss of 840 acres. Construction of buildings, off-road training exercises, and construction of simulated T/E roads in the HML training area would result in the long-duration disturbance of the proposed 600-acre area. These long-duration impacts would be small because of the low wildlife diversity currently supported by the habitats.

An increase in construction traffic, the influx of construction workers, and the operation of construction machinery at launch facilities and along T/E routes would cause some short-duration impacts to game and nongame wildlife species. Construction would disrupt daily/seasonal activities, increase stress during critical periods (i.e., big game wintering and calving/lambing periods and raptor nesting activities), increase wildlife mortality from animal-vehicle collisions, and cause some displacement. Upgrading bridges located in or near riparian habitats would also cause displacement of aquatic wildlife (e.g., waterfowl and shorebirds) and various raptor species. Bridge construction may cause minor habitat losses and temporary displacement of wildlife. Wildlife disturbance from construction activity would be temporary and recovery is expected within one or two seasons. Recovery of wildlife habitat may take longer and is dependent upon the type of habitat disturbed. Long-duration impacts would result from the permanent loss of approximately 388 acres of wildlife habitat that would be removed during launch facility expansion and T/E route upgrading. These losses represent minimal impacts to wildlife because of the small amount and marginal quality of habitat involved.

Approximately 36 launch facilities and 53 miles of T/E routes occur in severe wintering habitat for mule deer, white-tailed deer, and pronghorn. Road segment upgrade construction would disturb an additional 20 feet on one side of the road and would permanently remove approximately 129 acres of big game severe wintering habitat. Expansion of the 36 launch facilities located in big game severe wintering habitat (Table 4.8.2-2) would permanently remove an additional 58 acres. Impacts from the loss of severe wintering habitat are expected to be minimal because of the overall small amount of acreage involved and the marginal quality of the habitat that occurs within the already disturbed highway right-of-way and around the launch facilities.

Program operations would cause some long-duration impacts to big game and nongame species including disruption of daily/seasonal activities and displacement due to increased activities along T/E routes and at the launch facilities. The extent of these impacts is dependent upon the frequency of traffic, degree of human activity, and noise at the launch facilities. Wildlife species occurring in the areas of disturbance may

Table 4.8.2-2

Launch Facilities Within Big Game Severe Wintering Habitat

Launch Facility	Big Game Species		
	White-Tailed Deer	Mule Deer	Pronghorn
A-7		X	
A-8		X	
B-9		X	
B-11		X	X
C-3			X
C-6	X		
C-7	X		
C-8	X	X	
C-9		X	
C-10		X	
D-7		X	X
I-5			X
M-2	X	X	
M-4		X	
N-2			X
N-3			X
N-8	X		
O-2			X
O-6			X
O-7			X
O-9	X		
O-10	X		
O-11	X	X	X
P-2		X	
P-5		X	
P-8	X	X	
P-9	X		
Q-11		X	
Q-12		X	
Q-17		X	
Q-19		X	
R-22		X	
R-26		X	
S-32		X	
T-41	X	X	
T-44		X	

become conditioned to the moderate increase in activities; therefore, any disturbance that occurs may be temporary and eliminated as soon as the animal inhabitants become conditioned to operations activities. Program-induced population growth would increase regional hunting pressure during the life of the program. Certain areas near Malmstrom AFB (e.g., the Highwood and Little Belt mountains) are currently high-hunting pressure areas and would probably receive additional program-related pressure. Program-induced population growth would probably also cause a proportional increase in poaching.

Increases in nonconsumptive recreational activities (e.g., hiking, snowmobiling, photography, and bird watching) in the ROI would have indirect impacts (e.g., temporary displacement or disruption of daily/season activities) on the diverse and abundant wildlife

daily/seasonal activities, displacement, and increased stress during critical periods (e.g., times of reproduction), to various wildlife species and their associated habitats. This potential disturbance would result from increased human activity, traffic, and noise at construction sites. Major big game species of concern in the deployment area include mule deer, white-tailed deer, pronghorn, elk, and black bear. Onbase construction activities are not expected to affect any big game species; however, nongame species would receive some minimal impacts. Minor long-duration effects would result from habitat loss, operations (which would cause some disruption of daily/seasonal activities, displacement, and increased stress), and increased hunting pressure as a result of program-induced population growth.

No big game species are known to occur on Malmstrom AFB; however, small game and nongame species onbase would be affected by habitat loss resulting from construction of new facilities, development of the HML vehicle operations training area, and development of utility and transportation corridors. Short-duration disturbance of wildlife habitat from physical disruption would include approximately 321 acres associated with construction of new buildings onbase and long-duration disturbance onbase would result in the permanent loss of 840 acres. Construction of buildings, off-road training exercises, and construction of simulated T/E roads in the HML training area would result in the long-duration disturbance of the proposed 600-acre area. These long-duration impacts would be small because of the low wildlife diversity currently supported by the habitats.

An increase in construction traffic, the influx of construction workers, and the operation of construction machinery at launch facilities and along T/E routes would cause some short-duration impacts to game and nongame wildlife species. Construction would disrupt daily/seasonal activities, increase stress during critical periods (i.e., big game wintering and calving/lambing periods and raptor nesting activities), increase wildlife mortality from animal-vehicle collisions, and cause some displacement. Upgrading bridges located in or near riparian habitats would also cause displacement of aquatic wildlife (e.g., waterfowl and shorebirds) and various raptor species. Bridge construction may cause minor habitat losses and temporary displacement of wildlife. Wildlife disturbance from construction activity would be temporary and recovery is expected within one or two seasons. Recovery of wildlife habitat may take longer and is dependent upon the type of habitat disturbed. Long-duration impacts would result from the permanent loss of approximately 388 acres of wildlife habitat that would be removed during launch facility expansion and T/E route upgrading. These losses represent minimal impacts to wildlife because of the small amount and marginal quality of habitat involved.

Approximately 36 launch facilities and 53 miles of T/E routes occur in severe wintering habitat for mule deer, white-tailed deer, and pronghorn. Road segment upgrade construction would disturb an additional 20 feet on one side of the road and would permanently remove approximately 129 acres of big game severe wintering habitat. Expansion of the 36 launch facilities located in big game severe wintering habitat (Table 4.8.2-2) would permanently remove an additional 58 acres. Impacts from the loss of severe wintering habitat are expected to be minimal because of the overall small amount of acreage involved and the marginal quality of the habitat that occurs within the already disturbed highway right-of-way and around the launch facilities.

Program operations would cause some long-duration impacts to big game and nongame species including disruption of daily/seasonal activities and displacement due to increased activities along T/E routes and at the launch facilities. The extent of these impacts is dependent upon the frequency of traffic, degree of human activity, and noise at the launch facilities. Wildlife species occurring in the areas of disturbance may

Table 4.8.2-2

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Launch Facility	Big Game Species		
	White-Tailed Deer	Mule Deer	Pronghorn
A-7		X	
A-8		X	
B-9		X	
B-11		X	X
C-3			X
C-6	X		
C-7	X		
C-8	X	X	
C-9		X	
C-10		X	
D-7		X	X
I-5			X
M-2	X	X	
M-4		X	
N-2			X
N-3			X
N-8	X		
O-2			X
O-6			X
O-7			X
O-9	X		
O-10	X		
O-11	X	X	X
P-2		X	
P-5		X	
P-8	X	X	
P-9	X		
Q-11		X	
Q-12		X	
Q-17		X	
Q-19		X	
R-22		X	
R-26		X	
S-32		X	
T-41	X	X	
T-44		X	

become conditioned to the moderate increase in activities; therefore, any disturbance that occurs may be temporary and eliminated as soon as the animal inhabitants become conditioned to operations activities. Program-induced population growth would increase regional hunting pressure during the life of the program. Certain areas near Malmstrom AFB (e.g., the Highwood and Little Belt mountains) are currently high-hunting pressure areas and would probably receive additional program-related pressure. Program-induced population growth would probably also cause a proportional increase in poaching.

Increases in nonconsumptive recreational activities (e.g., hiking, snowmobiling, photography, and bird watching) in the ROI would have indirect impacts (e.g., temporary displacement or disruption of daily/season activities) on the diverse and abundant wildlife

in the area. However, these recreational activities are likely to be dispersed over a wide area and would have only a minimal impact on wildlife in the region.

A relatively small amount of habitat is expected to be temporarily or permanently lost due to the proposed program and the majority of impacts to wildlife are expected to be minor. These impacts can be further minimized through the implementation of appropriate mitigation measures. Impacts are summarized in Figures 4.0-1, 4.0.2, and 4.8.2-1 for launch facilities and T/E routes. Although there would be a range of site impacts at launch facilities (125 launch facilities are rated negligible, low and not significant, and 37 moderate and not significant for short-duration impacts; and 124 launch facilities are rated negligible, and 76 low and not significant for long-duration impacts), the accumulated impacts onbase, along T/E routes, and at launch facilities would remain approximately the same regardless of which launch facilities are chosen. No reduction in habitat carrying capacity (quantity of wildlife capable of being supported by a habitat) is expected nor would the reproductive potential of any wildlife species be adversely affected. Potential disturbance to wildlife is not likely to generate concern among natural resource management agencies or scientific authorities. Therefore, short- and long-duration, low, and not significant impacts would occur to wildlife.

4.8.2.3 Aquatic Habitats

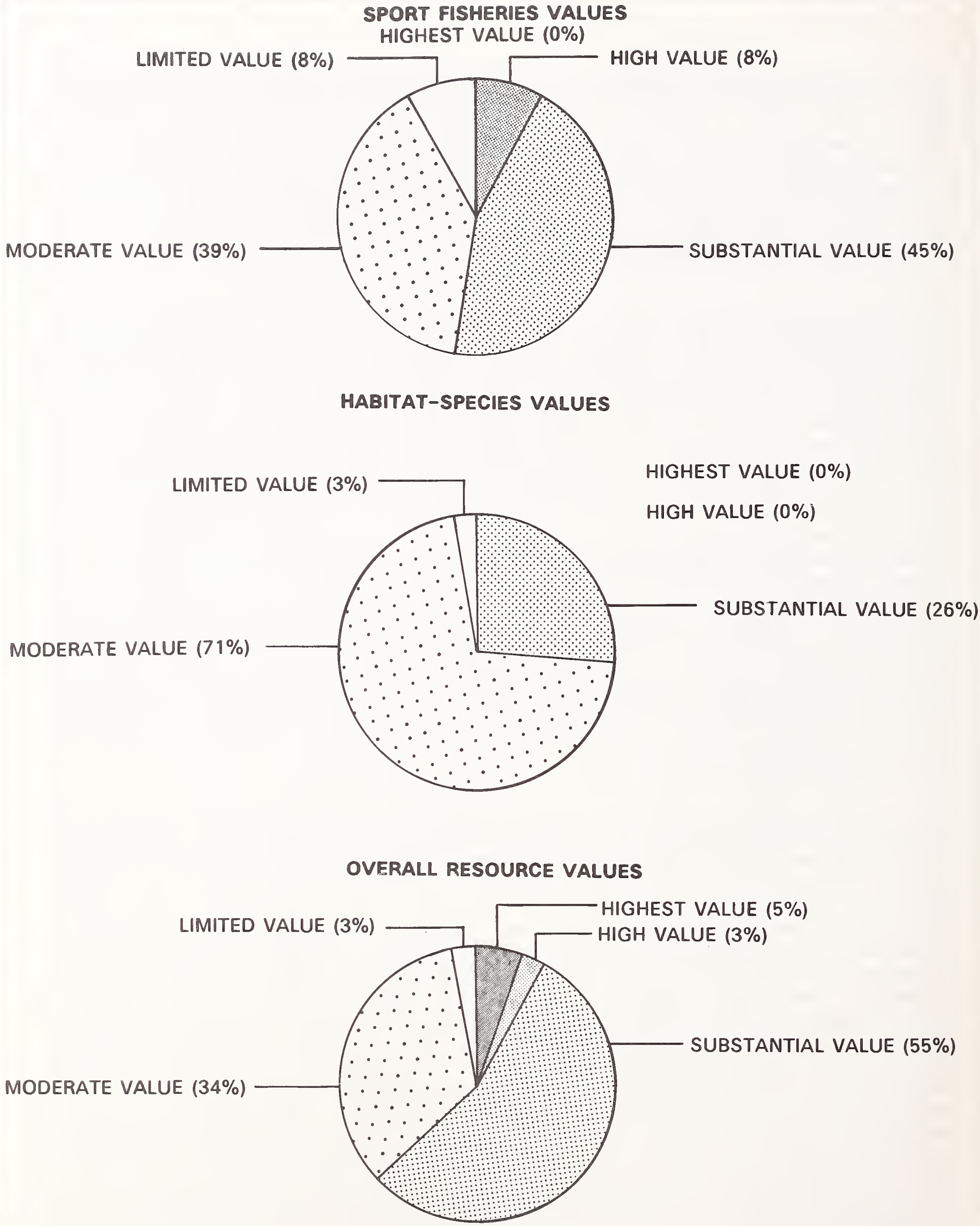
Short-duration impacts to aquatic habitats as a result of the Proposed Action would be moderate; long-duration impacts would be low. These short- and long-duration impacts would not be significant. Short-duration impacts to aquatic habitats would occur during the construction phase of the program. Bridge, culvert, and road construction may result in the temporary disturbance of some habitats and is likely to cause sedimentation in streams and wetlands (causing plant and animal mortality and loss of habitat). Long-duration construction impacts to aquatic habitats would occur where landfill encroaches on streams and wetlands. This would result in the direct loss of aquatic habitat or would create biological barriers to movement within the habitat. Operations would generally not produce any major impacts to aquatic habitats; however, off-road training maneuvers at Malmstrom AFB would cause erosion during the life of the program. Minor drainages near Malmstrom AFB would carry eroded sediments from the HML training area to the Missouri River. This increased sedimentation near the point of entry in the Missouri River would cause some degradation of fish habitat and may result in some increased fish mortality.

There are 4 launch facilities adjacent to prairie potholes and 30 launch facilities adjacent to streams or washes. Sixty-nine launch facilities are within 500 feet of an aquatic habitat. Launch facility O-11 is within a USFWS wetland easement, but is not within 1,000 feet of any wetlands. Construction at these launch facilities is likely to result in short- and long-duration disturbance to adjacent habitats (e.g., habitat disruption from machinery operating in the habitat) and sedimentation may occur in aquatic habitats bordering the launch facility construction areas (potentially killing aquatic biota and degrading the habitat value). Disturbance of prairie potholes is of regional concern to natural resources managers; however, the total amount of disturbance expected throughout the deployment area would be small and mitigations at each site, including the avoidance of equipment operation and landfill in wetlands, may further reduce these disturbances. Most of the perennial streams near launch facilities represent minor fisheries resources and are not adjacent to the launch facilities; therefore, only minor construction disturbance from potential erosion and sedimentation would occur. Possible exceptions to this are launch facilities in the Belt (A-5, A-6 and A-11), Wolf (C-10), and Otter Creek (A-4) drainages which are very close to these streams. Mitigation measures

in these areas should greatly reduce potential disturbances. Any disturbance of washes near launch facilities is unlikely to cause a substantial impact to aquatic habitats because these washes generally do not support important wetland vegetation or wildlife. The LOI and significance ratings for each launch facility are presented in Figure 4.0-1. Thirteen launch facilities are rated significant for short-duration site impacts (10 low, 1 moderate, and 2 high) and 3 launch facilities are rated low and significant for long-duration site impacts (Figure 4.8.2-1). Construction at most of the launch facilities would cause negligible long-duration site impacts and at a few there would be long-duration, low, and not significant site impacts.

Bridges to be upgraded have been identified at 124 locations, but many of these bridges do not cross aquatic habitats. Figure 4.8.2-2 shows 56 bridges to be upgraded that cross substantial aquatic habitats. Eighteen of these bridges cross streams considered to be important fisheries resources by the Montana Department of Fish, Wildlife and Parks (including the Missouri, Judith, Sun, and Teton rivers, and Elk, Warm Spring, and Wolf creeks). The majority of these streams are moderate to substantial resources in the department's stream data base. Construction at these bridge sites would result in local disturbance of streams from machinery, debris, and potential placement of structures in the streams and would produce sedimentation that is carried downstream. These impacts would be temporary and can be reduced by construction mitigations. These bridges are located throughout the deployment area (Figure 4.8.2-3), and short-duration construction impacts should not be large enough to generate any cumulative impacts within local or regional watersheds. The Montana Stream Protection Act governs the specifications of bridge construction in order to reduce or eliminate disturbance to habitats and to eliminate the creation of barriers to fish migration in streams. Bridges built in accordance with this Act should not result in any substantial long-duration impacts to aquatic habitats. Many existing culverts along the T/E route system would be replaced. Most of these culverts are on very small drainages and would not cause any noticeable impact to aquatic habitats. Culverts that do occur on important fisheries resources are also governed by the Montana Stream Protection Act and their replacement should not result in any long-duration impacts.

Road widening or other surface disturbances would result in potential direct impacts to streams and wetlands adjacent to the roadway (e.g., loss of habitat from landfill and mortality from equipment operation) and may cause some sedimentation in these habitats near the roadway. A USFWS wetland easement containing a prairie pothole occurs along Interstate 15, south of Dutton, Montana, in a potential road upgrade area. Construction may cause sedimentation and loss of habitat in this pothole. Potential road construction areas have been identified along the Belt and Wolf Creek drainages which are moderate to substantial fisheries resources in the Montana Department of Fish, Wildlife and Parks stream data base. Road construction along these streams would produce short-duration impacts primarily from increased sedimentation. Long-duration impacts to stream systems from road construction are unlikely if roads are built in accordance with the Montana Streambed and Landform Preservation Act (the Act is designed to reduce or eliminate undesirable disturbance of streams due to modifications such as channelization). Some landfill may occur in wetlands adjacent to roads; however, no major wetlands occur in the potential road construction area. Many minor wetlands (generally less than 1 acre) that occur along existing T/E routes were created, in part, by blocked drainages during original road construction. It is unlikely that construction from the program would result in any overall change from the baseline conditions for these small wetlands. The LOI and significance ratings for road segments are summarized by county in Figure 4.0-2.



Source: Montana Department of Fish, Wildlife and Parks 1986c.

EM4-BR/1

FIGURE 4.8.2-2 DISTRIBUTION OF STREAM VALUE CLASSES AT POTENTIAL BRIDGE IMPROVEMENT SITES

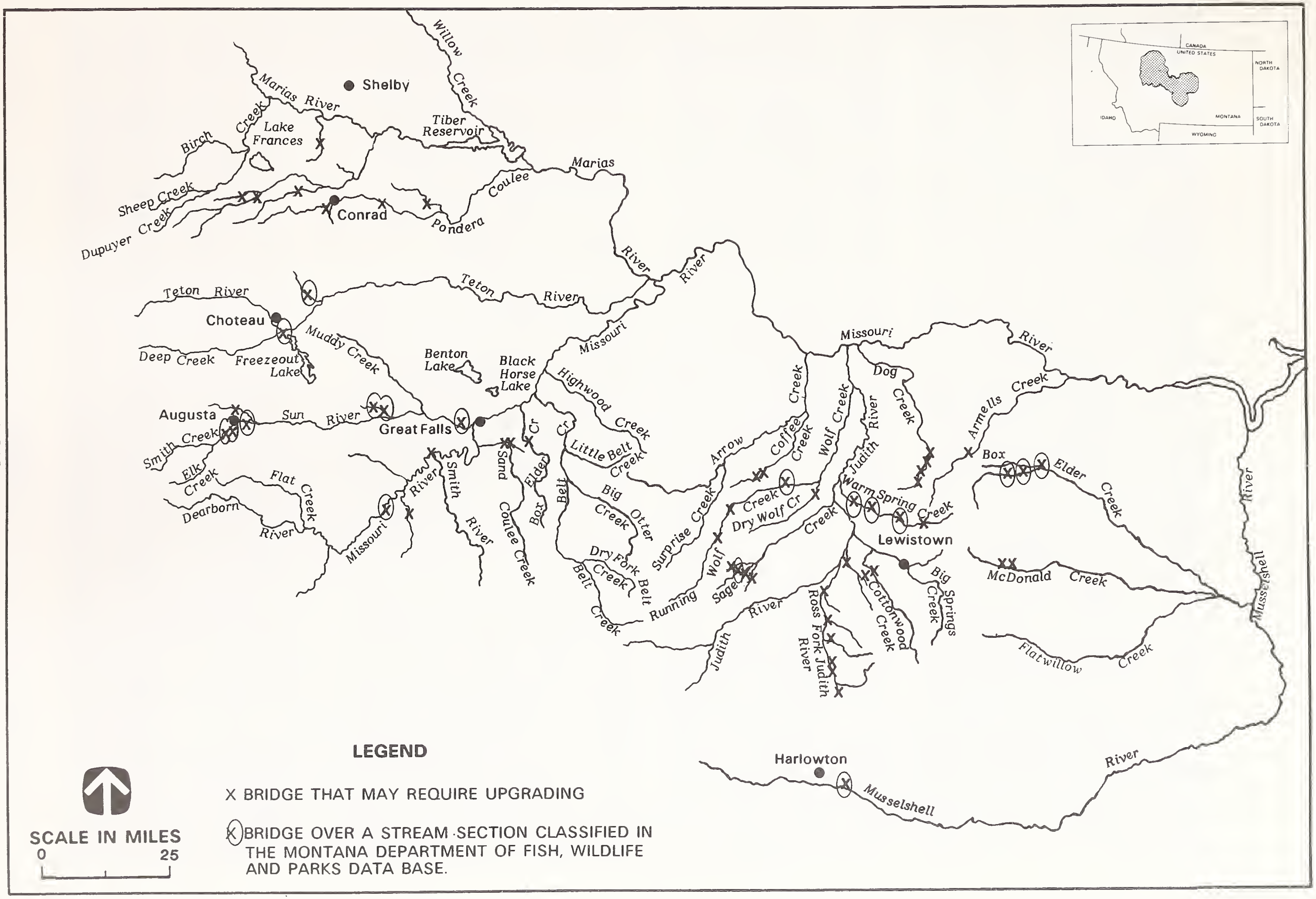


FIGURE 4.8.2-3 BRIDGE IMPROVEMENT SITES IN RELATION TO MAJOR STREAMS AND AQUATIC HABITATS

Operations-phase impacts to aquatic habitats are expected to be very small because there would be almost no additional disturbance of aquatic habitats and little chance for offsite disturbance that would affect the aquatic habitat's biota. Approximately 80 percent of the 600-acre HML vehicle operations training area would be regularly disturbed throughout the life of the program by off-road training activities. Sediments eroding from this site would enter the drainages on the base. These areas are not important wetland or stream habitats, but they do drain into the Missouri River. A minor net localized increase in the sediment load of the Missouri River is likely to occur and be of long duration because of these activities. The increased sedimentation should not produce serious disturbance to the biota or to the habitat quality of this section of the Missouri River. Normal operations would require periodic road maintenance and potential additional bridge renovation in the deployment area. These activities should produce only minor short-duration effects to aquatic habitats because only small areas will be disturbed.

The anticipated program-induced population growth (4.0% in the 9-county deployment area and 8.5% in Cascade County during operations) would cause additional recreational use of aquatic habitats. The expected increase in fishing and other aquatic recreation is well within the Montana Department of Fish, Wildlife and Park's projections for increases in sport fishery and aquatic habitat use in the regions to be affected by the program. Minor increased demand for aquatic recreational resources (especially fishing areas) would occur near Great Falls. The overall effect on fisheries would be minimal, but may require natural resource management agencies to modify local regulations (e.g., creel limits). Because there are ample fishing and recreation zones within commuting distance from Great Falls, few modifications are expected to be necessary to protect aquatic biota.

Although a range of site impacts may occur at launch facilities, accumulated impacts onbase, along T/E roads, and at launch facilities would remain approximately the same regardless of which launch facilities are chosen. Short-duration impacts to aquatic habitats would be moderate because of the quality of streams, prairie potholes, and other aquatic habitats that would be disturbed in the deployment area by launch facility construction, bridge replacement, and road construction/improvements. Long-duration impacts to aquatic habitats would be low overall. This long-duration rating is primarily based on the expected disturbance of prairie potholes at launch facilities. Although a large number of the aquatic habitats to be affected are of concern to aquatic resource managers, the expected level of disturbance and potential mitigations should reduce this concern. Cumulative impacts to aquatic habitats would be minor and should not affect the determination of significance of these impacts. Therefore, these short-duration, moderate and long-duration, low impacts would not be significant.

4.8.2.4 Unique and Sensitive Habitats

Overall short- and long-duration impacts to unique and sensitive habitats would be negligible. No unique and sensitive habitats are expected to receive direct impacts from either construction or operations. Freezeout Lake is crossed by a causeway on the T/E route system, but this section of road was recently rebuilt and should not require further modification for the program. Launch facility F-10 is adjacent to the southeastern boundary of Pine Butte Swamp Preserve. The southeastern portion of the area is not the primary habitat for grizzly bears from the preserve and does not contain substantial wetlands. Therefore, it is unlikely that construction activities at this launch facility would disturb any sensitive species on the preserve. All other identified unique and sensitive habitats are also distant from proposed construction and operations areas and

should not be directly affected by the program. Figures 4.0-1, 4.0-2, and 4.8.2-1 summarize impact ratings at launch facilities and along T/E routes, which are negligible for short- and long-duration effects.

Management plans for unique habitats near Great Falls, the major population center, may need to be altered as a result of program-induced population growth in Cascade County (8.5% during operation). Unique areas along the Missouri, Sun, and Smith rivers near Great Falls are not within defined public or private preserves and some development may occur near them to accommodate the expected population growth. However, these areas are sufficiently distant from the expected locations of program-related development and are likely to be only slightly affected. Benton Lake National Wildlife Refuge and Giant Springs State Park are close to Great Falls and would receive increased use as a result of the program, but their habitats are protected and should not be substantially affected. A large number of wildlife refuges, preserves, wilderness areas, and state and national parks occur throughout the deployment area and remaining ROI. Program-related population use is expected to be distributed among these habitats so that the biological resources of any one habitat would not be affected.

Because of the general lack of effects to unique and sensitive habitats, short- and long-duration impacts would be negligible. General concern by natural resource managers for impacts to unique habitats is also expected to be low.

4.8.2.5 Threatened and Endangered Species

Overall short- and long-duration impacts to threatened and endangered plant and animal species as a result of the proposed program would be low and not significant. Minor impacts to threatened and endangered species may occur during road and bridge upgrading and launch facility construction. Plant species are more likely to be affected by construction impacts than animals due to their immobility. Operations activities are not likely to adversely affect any threatened or endangered species.

Plants. Adverse impacts to threatened and endangered plant species may occur as a result of road and bridge upgrading and launch facility construction. Areas potentially disturbed during road upgrading are those that lie immediately adjacent to the existing roads. Much of this area was disturbed during initial road construction and is periodically disturbed by road and ditch maintenance activities and/or agricultural practices. Road upgrading may result in the loss of native prairie or forest and possibly in the disturbance of some special status species or their habitats. Potential impacts due to bridge upgrading include direct loss of aquatic or riparian species, increased sedimentation, and subtle changes in hydrologic characteristics of the area that may eventually change the aquatic nature of the site. Because many of the special status plant species under consideration inhabit aquatic or semi-moist sites, they may be adversely affected by bridge improvements. New development resulting from program-related population increases would be limited and is not expected to affect these species. No direct impacts are anticipated during the operations phase of the program, and program-associated recreational pressure is expected to be minor and dispersed because of the abundant recreational opportunities in the area.

No federally listed threatened or endangered plant species are known to occur in the deployment area or elsewhere in the ROI. One federal-candidate (Category 2) species, persistentsepal yellowcress, occurred historically in the Sun River-Benton Lake area. Potential habitat (along margins of alkaline ponds and marshes) occurs within the areas of direct surface disturbance and could be disturbed during construction.

Only one Montana-recognized species, long-styled thistle, is known to occur within the areas of direct surface disturbance. This species, considered by the Montana Natural Heritage Program to be imperiled in the state, occurs in at least two locations along the T/E routes near Monarch, Montana. In addition, other populations of this species may occur elsewhere along these routes. Road widening and upgrading in these areas are likely to remove these populations. Ten other Montana-recognized plants are known to occur in the general deployment area and may occur in the areas of direct surface disturbance (Table 4.8.2-3). Several sites along the T/E routes, access roads, and near launch facilities are known to provide potential habitat for these species. These sites would be surveyed during the spring and summer of 1987 and the findings presented in the final Environmental Impact Statement. Road and bridge upgrading and launch facility expansion could affect these species; however, application of appropriate mitigation measures can significantly reduce or offset any loss of habitat.

The 5 Category 2 species and 22 Montana-recognized species that occur or may occur elsewhere in the ROI are not likely to be adversely affected from increased recreational pressure. Many of these species occupy remote sites that are not readily accessible to the public.

Short- and long-duration impacts to threatened and endangered plant species are expected to be low because of the small number of habitats that would be affected, the small number of federally listed and Montana-recognized species that occur in the area of surface disturbance, and the reasonable likelihood of reducing or offsetting adverse impacts through application of appropriate mitigation measures. The proposed program is not expected to add substantially to the cumulative impacts of threatened and endangered species in the region and is not likely to generate major concerns on the part of natural resource management agencies or scientific authorities. Therefore, short- and long-duration impacts would not be significant.

<u>Animals</u>. There are five threatened and endangered animal species that occur or potentially occur in the deployment area. Those species listed as endangered include the bald eagle, American peregrine falcon, gray wolf (Northern Rocky Mountain wolf), and the black-footed ferret. The threatened grizzly bear also occurs in the deployment area. A biological assessment of potential impacts to these five species was prepared for the USFWS in accordance with Section 7 of the Endangered Species Act of 1973. It was concluded that no threat to the continued existence of threatened and endangered species would occur as a result of the program (this conclusion applies to the Proposed Action and alternatives [Section 4.8.3.5]). The USFWS has agreed with this conclusion and their response appears in Appendix C.

Of the five federally listed animal species potentially occurring in the deployment area, the bald eagle has the greatest potential to be affected. There are approximately 11 launch facilities in or near bald eagle habitat (Table 4.8.2-4). Approximately 450 to 500 bald eagles overwinter in Montana with some of these eagles occurring along the Missouri River south of Great Falls within the deployment area. Approximately 20 eagles also overwinter in the western portion of the deployment area primarily along Birch Creek, the middle fork of the Teton River, the North Fork of the Sun River, and associated drainages. No bald eagle habitat is expected to be lost as a result of program activities; however, increased traffic associated with construction activities, operation of heavy construction equipment, and increased noise levels at the 11 launch facilities located in or near potential bald eagle habitat and along T/E routes may temporarily disturb some eagles to a minor extent. Bridge upgrades in the deployment area may also cause some localized impacts to eagles due to the potential for affecting riparian habitat. Construction-related disturbance may include minor disruption of daily/seasonal movements (e.g., feeding and reproduction), increased stress during critical periods

Table 4.8.2-3

Potential Locations of Federal-Candidate and Montana-Recognized Plant Species in Areas of Direct Surface Disturbance

Common Name	Scientific Name	General Location
Chaffweed	Centunculus minimus	Great Falls area
Craw's sedge	Carex crawei	Choteau area
Dwarf wooly-heads	Psilocarphus brevissimus var. brevissimus	Great Falls area
Foxtail muhly	Muhlenbergia andina	Great Falls area
Graceful arrowgrass	Triglochin concinnum var. debile	Augusta area, Choteau area
Guadalupe water-nymph	Najas guadalupensis	Great Falls area
Klaus bladderpod	Lesquerella klausii	Bowman's Corner area
Long-styled thistle	Cirsium longistylum	Monarch area
Many-headed sedge	Carex sychnocephala	Great Falls area
Pale sedge	Carex livida	Choteau area
Persistentsepal yellowcress	Rorippa calycina	Sun River-Benton Lake area
Tapered rush	Juncus acuminatus	Choteau area

Table 4.8.2-4

Threatened and Endangered Animal Species Potentially Occurring in Areas of Direct Surface Disturbance

Common Name	Scientific Name	Launch Facilities In or Near Potential Habitat
Bald eagle	Haliaeetus leucocephalus	F-3, F-4, F-5, F-6, F-8, F-9, F-10, F-11, H-8, H-9, H-10
Grizzly bear	Ursus arctos	F-8, F-9, F-10, F-11
Gray wolf	Canis lupus	F-8, F-9, F-10, F-11
American peregrine falcon	Falco peregrinus anatum	Unknown[1]
Black-footed ferret	Mustela nigripes	Unknown[2]

Notes: [1]Distribution of the American peregrine falcon within the deployment area is not well defined.
[2]Black-footed ferrets are not known to occur in the deployment area; however, isolated populations may exist.

(e.g., overwintering and nesting periods), and possible displacement. These short-duration impacts, if they occur, can be minimized through the implementation of appropriate mitigation measures.

The American peregrine falcon, which is associated primarily with aquatic habitats, is believed to occur in the deployment area. Although the exact distribution of peregrines and the location of currently active aeries within the deployment area are not known, the program is unlikely to have any adverse effects on this species. Some minor impacts (disruption of daily/seasonal activities and displacement) may occur during the construction phase, particularly during bridge upgrading; however, these impacts would be temporary and can be mitigated.

Impacts to the grizzly bear and wolf, which are known to occur in the western portion of the deployment area, are unlikely to be adverse. No prime grizzly bear habitat would be disturbed, though some disruption of daily/seasonal activities and displacement may result from construction activities at launch facilities and along T/E routes that occur near grizzly habitat (Table 4.8.2-4). These impacts would be temporary and can be mitigated. The gray wolf also occurs in the same general area as the grizzly bear and may occasionally be found in the western portion of the deployment area (Table 4.8.2-4). The exact distribution and current population levels are not known; however, the wolf population is considered to be low. Wolves are unlikely to occur in the area of direct surface disturbance except as occasional transients. Consequently, the program is unlikely to adversely affect this species.

No black-footed ferret populations are known to occur in Montana. Furthermore, no prairie dog towns, which are the sole habitat of ferrets, occur on Malmstrom AFB, within T/E route rights-of-way, or within the anticipated construction boundaries of launch facilities. Therefore, no impacts to black-footed ferrets are anticipated.

In addition to the five federally listed species, there are eight federal-candidate and five Montana-recognized animal species that occur within the deployment area (Table 3.8.3-4, Section 3.8.3); none are known to occur on Malmstrom AFB. Construction activities along T/E routes and at launch facilities (particularly those located in open, grassland areas) may cause some short-duration impacts to the ferruginous hawk, northern swift fox, upland sandpiper, long-billed curlew, mountain plover, and sage sparrow. Loss of these species' habitats is expected to be low in the deployment area. Temporary disruption of daily/seasonal activities and reproductive behavior for these species may result from construction activities. In addition, bridge upgrades may temporarily affect certain aquatic and riparian species. These species include Preble's shrew, Canadian toad, Harlequin duck and milk snake. The wolverine and lynx, which generally occur in mountainous areas, are unlikely to receive any direct impacts from program activities. The spotted bat which inhabits rocky cliffs is also unlikely to be affected.

Some operations impacts to threatened and endangered animal species would occur during the life of the program. Increases in daily security traffic, maintenance activities, human activities, and noise at the launch facilities and along T/E routes may cause some disruption of daily/seasonal activities and displacement; however, these disruptions are expected to be minor.

In addition to those species that occur in the deployment area, two federally listed, six federal-candidate, and six Montana-recognized animal species (Table 3.8.3-4, Section 3.8.3) occur in the ROI but outside the deployment area. Program-induced

population growth would cause an increase in nonconsumptive recreational activities (e.g., hiking, snowmobiling, photography, and bird watching) which may cause some temporary displacement and disruption of daily/season activities of the threatened and endangered species found in the ROI. These recreational activities would be dispersed over a wide area and would have very little impact on threatened and endangered animal species in the region.

Short- and long-duration impacts to threatened and endangered animal species are expected to be low because of the small amount of habitat that would be lost or disturbed and the minimal impacts expected for species occurring in the area of direct surface disturbance. Although a range of site impacts would result dependent upon which launch facilities are chosen (Figure 4.8.2-1), impacts accumulated along T/E routes and at launch facilities would remain approximately the same. In addition, program impacts are not expected to add substantially to the cumulative impacts to threatened and endangered species in the region, nor would these impacts generate concern among natural resource management agencies or scientific authorities. Any impacts that are likely to occur can be minimized through the implementation of appropriate mitigation measures. Therefore, short- and long-duration impacts to threatened and endangered animal species are not expected to be significant. Impacts to threatened and endangered plants and animals at launch facilities and along T/E routes are summarized in Figures 4.0-1, 4.0-2, and 4.8.2-1. Because these impacts to plant and animal threatened and endangered species would be minor, overall short- and long-duration impacts to threatened and endangered species would be low and not significant.

4.8.3 Impacts of Alternatives

Impacts to biological resources and threatened and endangered species are only expected to vary to a minor degree between the Proposed Action and Alternatives 1 and 2. Alternative 1 would result in approximately the same disturbance at the launch facilities as the Proposed Action because the same number of launch facilities would be used. Alternative 2 would utilize 125 launch facilities, which reduces the opportunity to avoid impacts at the launch facilities through site selection. Impacts along T/E routes would remain approximately the same because both Alternatives 1 and 2 are likely to use the entire T/E route system. From an overall perspective, the differences in impacts between Alternatives 1 and 2 are minor and the overall impact ratings for each element would not change regardless of the range of site impacts at launch facilities. A decision to use Alternative 3 would eliminate the opportunity to reduce impacts through site avoidance and would result in substantial impacts at some sites (Figure 4.8.2-1). Overall short-duration impacts to vegetation, wildlife, and threatened and endangered species for Alternatives 1, 2, and 3 would range from low to moderate and not significant. Long-duration impacts to these resources for all alternatives would be low and not significant. For aquatic habitats, short-duration impacts from all three alternatives would be moderate and not significant. Long-duration aquatic habitats impacts would be low and not significant. Alternatives 1, 2, and 3 would result in short- and long-duration, negligible impacts to unique and sensitive habitats.

4.8.3.1 Vegetation

Impacts to vegetation for Alternatives 1 and 2 are very similar to impacts identified for the Proposed Action (proportions of each vegetation type disturbed remain the same) and differ only in extent. Construction of new facilities, roads, and bridges would result in both short- and long-duration disturbance of vegetation as discussed in Section 4.8.2.1. Disturbance to vegetation in the deployment area during the operations phase is expected to be minimal for the Proposed Action and Alternatives 1 and 2.

Alternative 1. Alternative 1 would result in disturbance to the same number of launch facilities as the Proposed Action and the same surface disturbance. Short- and long-duration impacts to vegetation would remain low and not significant.

Alternative 2. Alternative 2 would result in additional disturbance of vegetation per launch facility, a cumulative 375 acres (200 acres permanently and 175 acres temporarily disturbed) for 125 launch facilities. For this analysis, road and bridge upgrading was assumed to be the same as the Proposed Action. Short- and long-duration impacts to vegetation would remain low and not significant.

Alternative 3. Alternative 3 would result in reduced disturbance of vegetation per launch facility (2 acres) but would occur at 200 launch facilities which would result in approximately 400 acres (200 acres permanently and 200 acres temporarily) disturbed. For this analysis, road and bridge upgrading was assumed to be the same as the Proposed Action. Overall short- and long-duration impacts to vegetation would be low and not significant, but would be more adverse than the Proposed Action because the environmentally sensitive launch facility areas mentioned in Section 4.8.2.1 would not be avoided.

4.8.3.2 Wildlife

Impacts to wildlife species from the Proposed Action and Alternatives 1 and 2 differ only to a minor degree with respect to the number of acres of habitat disturbed. Construction activities (i.e., expansion of launch facilities, upgrading T/E routes and bridges, and building new facilities onbase) associated with Alternatives 1 and 2 would cause some short- and long-duration disturbance of wildlife and associated habitats. Operations impacts over the life of the program would be minimal for Alternatives 1 and 2. Impacts from Alternative 3 would be similar; however, the use of 200 launch facilities would eliminate the opportunity to entirely avoid sensitive habitats at some launch facilities.

Alternative 1. Alternative 1 would result in almost the same amount of disturbance to wildlife as the Proposed Action. Approximately 388 acres of habitat would be lost due to expansion of launch facilities and road upgrading and 808 acres would be permanently disturbed onbase. Overall short- and long-duration impacts to wildlife from Alternative 1 would be low and not significant.

Alternative 2. Alternative 2 would cause the loss of approximately 200 acres of habitat at the launch facilities from permanent disturbance and 175 acres from temporary disturbance. The same T/E routes would be upgraded for Alternative 2 as the Proposed Action. Approximately 878 acres would be permanently disturbed and 348 acres would be temporarily disturbed onbase. Construction activities associated with Alternative 2 would cause minor impacts to wildlife in the region because relatively small amounts of habitat would be disturbed. These short- and long-duration impacts would be low and not significant.

Alternative 3. Alternative 3 would cause the permanent loss of approximately 200 acres of habitat due to expansion of launch facilities. Disturbance along T/E routes, access roads, and onbase was assumed to be similar to the Proposed Action. Although loss of wildlife habitat for Alternative 3 would be similar to the Proposed Action, use of 200 launch facilities would increase the chance of adversely affecting wildlife and sensitive areas such as big game wintering habitats. Therefore, short-duration impacts would be moderate and long-duration impacts would be low. Neither short- or long-duration impacts would be significant.

4.8.3.3 Aquatic Habitats

Impacts to aquatic habitats and biota from Alternatives 1, 2, and 3 would be similar to the Proposed Action. The number of habitats affected would change slightly with Alternatives 1 and 2, especially at launch facilities, but the regional effect would remain approximately equal to the Proposed Action. Therefore, no change is expected in the overall impact rating. Because all launch facilities would be used in Alternative 3, some severe short-duration site impacts are expected to occur.

Alternative 1. For Alternative 1, impacts along T/E routes and at launch facilities are expected to remain at the same level because the same number of launch facilities would be used. Short-duration impacts to aquatic habitats would be moderate and long-duration impacts would be low. These short- and long-duration impacts would not be significant.

Alternative 2. Because 125 launch facilities would be used, Alternative 2 would result in slightly greater impacts than the Proposed Action; however, this increase is minor on a regional basis. Short-duration impacts for Alternative 2 would be moderate and long-duration impacts would be low. Both short- and long-duration impacts would not be significant.

Alternative 3. Alternative 3 would result in the maximum disturbance of aquatic habitats at launch facilities. These additional impacts at launch facilities would result in some severe, local impacts but do not represent a substantial change from the Proposed Action on a regional basis. Short-duration impacts would be moderate and long-duration impacts would be low for Alternative 3. These short- and long-duration impacts would not be significant.

4.8.3.4 Unique and Sensitive Habitats

Because of the low level and types of impacts likely to occur in unique and sensitive habitats, there is no difference between the Proposed Action and Alternatives 1, 2, and 3. Short- and long-duration impacts to unique and sensitive habitats would be negligible for Alternatives 1, 2, and 3.

4.8.3.5 Threatened and Endangered Species

Impacts to threatened and endangered species for Alternatives 1 and 2 are similar to impacts identified for the Proposed Action. Road and bridge upgrades and launch facility construction would result in some short- and long-duration disturbance of threatened and endangered species. However, these impacts are expected to be minor for Alternatives 1 and 2. Alternative 3 would eliminate the opportunity to avoid launch facilities in threatened and endangered species habitat and would increase the probability of disturbance to them.

Alternative 1. Alternative 1 would have the same potential for affecting threatened and endangered species as the Proposed Action. Short- and long-duration impacts to threatened and endangered species would be low and not significant.

Alternative 2. Alternative 2 would have a slightly greater potential for affecting protected species than the Proposed Action because more launch facilities would be expanded, increasing the probability that some threatened and endangered species or their habitats would be affected. Several sensitive plant species are known to occur in the Monarch area of the Little Belt Mountains. The probability of avoiding this area is

lower for Alternative 2. It is unlikely that any protected species would be substantially affected and onsite mitigation would further reduce these impacts. Therefore, short- and long-duration impacts would remain low and not significant.

Alternative 3. Alternative 3 would have an even greater potential for affecting protected species than the Proposed Action because more launch facilities would be expanded. Expansion of all 200 launch facilities would increase the probability of disturbing threatened and endangered species because sites with known populations or potential habitat of threatened and endangered plants would be disturbed; however, many of these disturbances are the result of construction and could be reduced through mitigation. Potential locations of these species are shown in Table 4.8.2-3 (Section 4.8.2.5). Short- and long-duration impacts would be moderate and not significant.

4.8.4 Cumulative Impacts

Deployment of Peacekeeper in Rail Garrison at Malmstrom AFB would represent a cumulative impact to the Small ICBM program because there would be additional disturbance of land on the base (it would not add to areas disturbed in the deployment area for the Small ICBM). This cumulative disturbance on Malmstrom AFB would increase the temporary disturbance of vegetation by 126 acres and the permanent loss by 166 acres of vegetation because of new construction. There is no substantial wildlife habitat onbase and cumulative impacts to wildlife would be minor. The requirements for onbase construction may disturb some small wetland areas near the Weapons Storage Area. No additional disturbance to unique and sensitive habitats or threatened and endangered species is expected. Peacekeeper in Rail Garrison operations are not expected to produce any impacts to biological resources because the activity and disturbed habitat is confined to Malmstrom AFB and does not represent biologically valuable habitat. Therefore, cumulative impacts to biological resources from construction and operations represent very minor additions (low and not significant for vegetation and negligible for all other elements) to the impacts for the Proposed Action and would be not significant.

4.8.5 Impacts of the No Action Alternative

If the proposed program is not implemented, present activities, policies, and trends will continue to have impacts to biological resources. New and continuing programs, missions, and associated construction at Malmstrom AFB can be expected to disrupt biological habitat. Building associated with the KC-135R air refueling mission will disturb grassland and minor wetland habitats onbase. These present and future programs will disturb almost as much land onbase as the Proposed Action. No other programs are presently planned that will cause disturbance at the launch facilities and no other government or private activities should cause disturbance at the launch facilities. Roads and bridges throughout the state will continue to be improved on an as-needed basis because of normal wear and additional demand from growth.

Regional recreational activities, such as off-road vehicle use, boating, hunting, and fishing, may also adversely affect biological resources in the ROI. Most of the ROI is experiencing at least modest rates of growth and development. Construction will result in loss of biological habitat and disruption of ecological communities. Increasing population size will lead to increased recreation-related impacts. Increased development and recreation will degrade aquatic habitats and biologically unique habitats, and add to cumulative impacts to threatened and endangered species.

4.8.6 Potential Mitigation Measures

Potential mitigations are measures that could be undertaken to reduce or eliminate program impacts. All, some, or none of the measures identified for biological resources and threatened and endangered species may be implemented. For each measure, the agencies that may be involved in implementation are identified. The Air Force would encourage implementation of these measures through environmental awareness and other programs. Potential mitigation measures for biological resources and threatened and endangered species include the following:

- Coordinate the method and extent of construction activities near critical wildlife and fisheries habitat in accordance with interests, guidelines, and/or regulations of the USFWS and the Montana Department of Fish, Wildlife and Parks and adopt appropriate measures to minimize impacts wherever possible. Measures to be considered include:

  - Limit the areal extent of construction disturbances to the minimum possible. This mitigation measure would be of particular importance at 37 launch facilities in forested and riparian areas where the impact to wildlife would be the greatest. Construction equipment should be operated only on roads or within the designated disturbance area (U.S. Air Force).

  - Restore or enhance disturbed habitats after construction, to the extent possible through grading, revegetation, or other means. This mitigation measure would help the area return to predisturbance conditions, thus reducing or eliminating the loss of biological productivity within the shortest possible time. (Montana and federal highway departments and U.S. Air Force).

  - Transplant sensitive species that would be disturbed in cases where transplanting is considered the only feasible means to compensate for site impacts that are unavoidable because of the final deployment configuration. This mitigation measure may apply to 11 potential bridge upgrade, 4 road segment, and 6 launch facility sites that may support federal-candidate or Montana-recognized plant species of concern (U.S. Air Force).

  - Implement offsite habitat restoration or increase protection of sensitive species or their habitat if offsite mitigation is considered the only feasible means to compensate for site impacts to threatened and endangered species habitat or sensitive wetlands (U.S. Air Force).

- Build sediment traps on drainages flowing away from the HML vehicle operations training area to control impacts from increased erosion in the area. This would reduce potential impacts to the biota in the Missouri River near Great Falls that could occur if these eroded sediments were allowed to enter the river (U.S. Air Force).

- Include measures in the environmental awareness program to educate program personnel on the importance of minimizing environmental damage to natural habitats and inform them about legal hunting practices and the importance of hunting safety (U.S. Air Force, USFWS, and the Montana Department of Fish, Wildlife and Parks).

4.8.7 Irreversible and Irretrievable Resource Commitments

The expected operational life of the proposed program is 20 years. Disturbed biological communities, given sufficient time, can usually recover to a state approximating predisturbance conditions once the disturbance ends. Therefore, few of the biological impacts expected from the proposed program would be irreversible or irretrievable in the strict sense. However, some of the expected impacts are likely to be of such long duration that they would represent irreversible or irretrievable commitments of biological resources for all practical purposes. For example, some of the long-duration disturbance of vegetation and wildlife habitat expected from construction, such as the removal of vegetation and habitat for construction of buildings, roads, or other facilities, may remain disturbed longer than 20 years. These long-duration commitments of biological resources are expected to be negligible for this program for three reasons: (1) relatively little undisturbed biological habitat would be affected, (2) much of the habitat expected to be affected has already been severely disturbed by agriculture and ranching, and (3) the moderate, seasonably wet climate supports relatively fast growth rates and biological communities can generally recover from disturbances or be replaced by successional communities within a relatively short-time span.

In addition, some potential impacts of the proposed program could be literally irreversible or irretrievable. Removal of an aquatic habitat for construction of a program facility represents an irretrievable loss of that habitat. Restoration or replacement with another aquatic habitat could be infeasible, depending on the location, and the new habitat is not likely to have the same ecological value of the lost habitat. Therefore, the loss of the original habitat cannot be completely mitigated. If the proposed program resulted in loss or degradation of the biologically unique characteristics of a unique and sensitive habitat, it is not likely that the biological uniqueness of the habitat could redevelop or be restored, at least in the foreseeable future. Extinction of a threatened or endangered species is irretrievable, but the proposed program would be implemented so as to not cause the extinction of any species.

4.8.8 Relationship Between the Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The proposed program is not expected to have a long-duration adverse effect on regional biological productivity because this system would disturb only relatively small areas, much of which are already disturbed, so that little cumulative productive biological habitat would be lost. In addition, ecological recovery rates in the proposed locations for development are relatively fast.

4.9 Water Resources

The deployment of the Small Intercontinental Ballistic Missile (ICBM) at Malmstrom Air Force Base (AFB) would result in increased water demand during both the construction and operations phases of the program. The proposed program would affect the quality of surface or groundwater features near the construction sites and the amount of current water use in the Region of Influence (ROI). To evaluate proposed program effects, impacts on water use and surface and groundwater hydrology and quality were analyzed.

4.9.1 Impact Analysis Methodology

The impact analysis methodology for water resources involved three separate procedures: evaluation of program impacts, determination of levels of impact (LOI), and determination of the significance of impacts. The methodology also included consideration of a number of assumptions and assumed mitigations. Impacts were evaluated at the site, local and regional levels. Site impacts include those effects immediately around and downstream of program construction activities. Local and regional impacts relate to program effects on surface and groundwater basins and the water supplies serving the affected communities in the ROI. Finally, an overall impact assessment was made for each resource element.

4.9.1.1 Evaluation of Program Impacts

Water Use. Total water use associated with the proposed program was evaluated for each year of the construction phase (1990 to 1995) and for the year 2000 (a typical year of full program operations). Estimates of construction-related water requirements for the proposed program were derived from other military program historic data. All onbase construction and operations water needs were assumed to be drawn from the base water supply system. Onbase operations-related water requirements were estimated based on a factor of 50 gallons per capita per day (gpcd) for Malmstrom AFB operations personnel.

Deployment-area water requirements for program operations were estimated based on a factor of 70 gpcd for personnel at Hard Mobile Launcher (HML) shelters. Domestic water use by program-related inmigrants was estimated by applying area-specific, per capita water use factors to program-induced inmigrant projections developed from the socioeconomic analysis (Section 4.1). A factor of 150 gpcd was applied to inmigrants residing in military housing on Malmstrom AFB. Program-related water use by civilian inmigrants and weekly commuters to the communities affected by the program were calculated using daily per capita water use factors for each community. These factors were averaged over the last 5 years and corrected for industrial or other nonprogram-related use. For Great Falls, Lewistown, and Conrad, the per capita water use factors of 160 gpcd, 200 gpcd, and 140 gpcd, respectively, were used.

Water use figures were calculated for Great Falls, Malmstrom AFB, Lewistown, and Conrad for each year of the projected period. Program-related requirements were compared to future baseline use to evaluate the relative annual increase in water use. Finally, the annual water entitlement of each affected town was compared to the town's peak annual, baseline-plus-proposed program water use to evaluate the adequacy of the municipal water supply and the likelihood of interference with existing users. Emphasis was placed on identifying potential water shortages and/or the need to accelerate future water-development plans. Potential program effects upon agricultural and rural users in the deployment area were also assessed.

Surface Water Hydrology and Quality. For cities in the ROI using surface water as a supply source, the peak-year, program-induced water requirements were compared to the average annual flow of the stream supplying the town. The potential for reduction in surface water flows was then determined. Using available water quality data and the dilution capacity of the receiving stream, a qualitative assessment was made of the potential for degradation of baseline water quality due to program-induced increases in effluent discharge from the affected city.

Water quality impacts in the deployment area were assessed by first plotting an overlay of the location of ground-disturbing activities, such as bridge replacement, road upgrades, and HML-shelter construction, on a map of perennial streams and lakes. Bridge construction and ground-disturbance activities within 1 mile of such resources were analyzed for potential water quality impacts, particularly sedimentation during construction. Factors taken into account included the amount of construction activity within each major watershed, the size of the watershed, the proximity of the construction site to the affected stream, and the sensitivity of the stream to water quality degradation, based on current state-designated stream classifications.

The potential for local changes in drainage patterns and stormwater hydrology due to construction activity at Malmstrom AFB and Great Falls was investigated. Data on local soils and land use were combined to determine the storm-runoff characteristics of selected drainage areas under both baseline and proposed program conditions. Runoff from both scenarios was calculated using the U.S. Soil Conservation Service urban-runoff model, TR-20. The design storm used in the analysis was the 10-year, 2-hour rain event (1.22 inches) used by the City of Great Falls Engineering Department.

Groundwater Hydrology and Quality. Major groundwater resources in the deployment area were analyzed. Potential program-induced pumpage was compared to baseline regional groundwater withdrawal. Areas where program pumpage might affect the groundwater system, reducing groundwater availability, were identified. An evaluation of the groundwater resources was also conducted for Lewistown, whose water supplies are derived from Big Springs. In this case, the peak-year, program-induced water diversion was compared with the average annual flow of the springs to evaluate the potential for spring-flow reduction.

Existing launch facilities with saline-seep areas within 0.5 mile were determined from aerial photographs taken in May 1986. Additional launch facilities that lie within areas highly prone to saline seep were identified using maps developed by the Montana Cooperative Extension Service and from the files of the Montana Salinity Control Association. This information was used to identify those launch facilities where additional clearing and construction might intensify saline-seep problems.

4.9.1.2 Determination of Levels of Impact

The magnitude of program impacts on water resources was evaluated using the LOI criteria shown below for each element. Program impacts were assessed at the site, local, and regional levels. Differences between site and local or regional LOI criteria are explained.

Water Use. The LOI definitions for water use are the following:

- Negligible Impact -- Program-induced water needs would use little or none of the developed water sources. There is no application for or purchase of water rights.

- Low Impact -- Program-induced water requirements would use an appreciable fraction of the developed and/or legally available water sources. Temporary permits to appropriate water would be applied for and/or some existing water rights would be leased.

- Moderate Impact -- Program-induced water needs would use a substantial amount of the remaining physical capacity and/or legal allocation of the developed water sources. New, permanent water rights would be applied for and/or some existing rights would be purchased.

- High Impact -- Program-induced water requirements would use all or most of the remaining physical capacity and/or legal allocation of the developed water sources. Substantial, additional water resources development would have to take place to meet program needs.

Surface Water Hydrology and Quality. The LOI definitions for surface water are the following:

- Negligible Impact -- No appreciable effects would occur to the flow or quality of the surface water resources as a result of the program.

- Low Impact -- Appreciable changes in the flow and/or quality of the surface water resources would result from the proposed program. However, decreases in perennial streamflow would be small and water quality would decline only slightly. Small increases in stormwater runoff may occur. No additional facilities or changes in water management practice are needed to handle these changes. At the site level, a substantial, but very short-duration increase in sedimentation would occur at isolated points along streams classified as B2 (domestic supply, marginal coldwater fishery; see Section 3.9.3, Figure 3.9.3-2) or lower.

- Moderate Impact -- Substantial decreases in perennial streamflow, declines in the quality of the surface water resources, and/or increases in stormwater runoff are likely to occur. Construction of minor facilities and/or minor modification of water-management practices may be required to handle the hydrologic changes. At the site level, a substantial, but short-duration increase in sedimentation would occur at isolated points along streams classified as B1 (domestic supply, coldwater fishery), or at two or more points in proximity to each other along streams classified as B2 or lower. Alternately, elevated sedimentation to a stream classified as B2 or lower is expected to occur during a recovery period of considerably longer duration.

- High Impact -- Major decreases in perennial streamflow, declines in surface water quality, and/or increases in stormwater runoff are likely to occur. Construction of major facilities and/or substantial modification of water-management practices may be required to handle the hydrologic changes. At the site level, a substantial, but very short-duration increase in sedimentation

would occur at two or more points in proximity to each other along streams classified as B1. Alternately, elevated sedimentation to a B1 stream is expected to occur during a recovery period of considerably longer duration.

Groundwater Hydrology and Quality. The LOI definitions for groundwater are the following:

- Negligible Impact -- Little or no groundwater would be withdrawn to support the proposed program. No appreciable change would occur to the quantity or quality of the groundwater resources in the ROI.

- Low Impact -- The proposed program would use a minor portion of the groundwater resources. No appreciable changes in groundwater quality are likely to occur.

- Moderate Impact -- The proposed program would require substantial additional development of the groundwater resources with some decline in groundwater levels likely. Potential declines in groundwater quality would be minor.

- High Impact -- Program-induced groundwater requirements would cause major groundwater drawdown. Potential declines in groundwater quality may be substantial.

4.9.1.3 Determination of Significance

The significance of water resources impacts were evaluated in accordance with Council on Environmental Quality (CEQ) regulations. Significance was assessed through evaluation of the context and intensity of the impacts. Context includes consideration of the settings (site, local, or regional) and the duration of the impacts. The CEQ regulations provide ten items that should be considered in evaluating intensity. Of these ten items, the following are applicable to water resources:

- The degree to which the proposed action affects public health or safety;

- Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas;

- The degree to which the effects on the quality of the human environment are likely to be highly controversial;

- The degree to which the possible effects upon the human environment are highly uncertain or involve unique or unknown risks; and

- Whether the action threatens a violation of Federal, State, or local laws or requirements imposed for the protection of the environment.

In addition to these considerations, the following considerations are judged appropriate in evaluating significance for water resources.

Water Use.

- Whether the proposed program would result in the development of more costly sources of water and a potential rise in the cost of obtaining water by other major users;

- The degree to which the proposed program would either result in or intensify periods of water shortage or temporary curtailment of water to existing users, reducing the reliability of the existing water supply and/or resulting in inconvenience or economic hardship; and

- Whether substantial shifts in the types of water use would occur (including the elimination of one or more major types of water use) changing the economic and social patterns of an area.

Surface Water Hydrology and Quality.

- The degree to which stream water quality degradation resulting from the program would impair state-designated uses, reducing the value of the stream for aquatic habitat maintenance or other downstream use.

- Whether the dewatering of one or more perennial streams is of a magnitude that a substantial depletion of the resource occurs. (As a result of stream flow reduction and/or cessation, important characteristics such as the aesthetic and recreational values of the affected streams would be severely reduced).

- The degree to which the proposed program results in changes in the drainage and/or flood characteristics of a stream which would result in substantial increases in downstream damage.

Groundwater Hydrology and Quality.

- The degree to which the proposed program is likely to result in a reduction or cessation of the flow of one or more major springs. (Such springs are unique geographic features and their loss represents a substantial depletion of groundwater resource.)

- Whether declines in groundwater levels are of a magnitude that substantial depletion of the resource occurs. (As a result of declining groundwater levels, there may be a reduction in the baseflow of streams to which the groundwater discharges. Alternatively there may be a substantial reduction in the capacity of major production wells forcing their deepening or abandonment at substantial cost to existing users.)

- Whether the program threatens degradation of groundwater quality to the point that federal drinking water criteria may be exceeded.

4.9.1.4 Assumptions and Assumed Mitigations

Several assumptions were made in developing the water resources impact analysis and include the following:

- The Air Force would, to the extent reasonable and practicable, meet state and local standards regarding erosion control, protection of public water supplies, and maintenance of stream water quality;

- Water acquisition efforts would follow state law; and

- The per capita water use factors used to calculate program-induced water use would remain constant throughout the proposed program.

Certain practices are part of standard Air Force policy and construction procedures. The following assumed mitigations have been factored into the evaluation of the LOI and significance of the proposed program upon the water resource system:

- Minimization of site disturbance and the implementation of proper revegetation techniques to reduce soil-erosion potential; and

- State-approved wastewater collection and disposal systems would be provided to handle program-related wastewater during both the construction and operations phases.

4.9.2 Impacts of the Proposed Action

Total program-related water use would range from 4,840 to 5,000 acre-feet (acre-ft) over the construction phase and from 1,460 to 1,530 acre-feet per year (acre-ft/yr) during the operations phase, depending on the housing option chosen. Approximately 85 percent of the total water use during the construction and operations phases would be required for domestic use by program-related inmigrants. Most of the program-induced water use would be supplied by surface water sources. Overall, the impacts would be the same for all of the housing options. Some short- and long-duration, low impacts on water use and surface water would occur. The short-duration impacts on groundwater resources would be low, and the long-duration impacts would be negligible. None of these impacts would be significant at the ROI level (Figures 4.9.2-1 and 4.9.2-2).

4.9.2.1 Water Use

Most of the program-induced increases in water use would occur at three towns: Great Falls, Lewistown, and Conrad. The supplies of these towns can readily meet program water requirements. The effect on other towns within the ROI would be minimal. Therefore, the overall short- and long-duration impact on water use would be low and not significant. The selection of either Housing Option H1 or H2 would not change the impacts to water use discussed under the Proposed Action. The short- and long-duration impacts would remain low and not significant.

Program-related water use can be divided into four components: use at Malmstrom AFB, use at the major support community of Great Falls, use in Lewistown and Conrad, and use during construction and operations activities.

Water use at Malmstrom AFB is the largest component of program-related water requirements under the Proposed Action and consists of onbase construction and operations water needs and domestic-water use by military inmigrants. During the 6-year construction phase (1990-1995), water requirements to support onbase construction would amount to 50 acre-ft, operations water needs would amount to 350 acre-ft, and domestic water use by military inmigrants would amount to 2,950 acre-ft. Together,

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible		
Low	○	●
Moderate	○	●
High	○	●
Beneficial Effects		

Note: Some resource elements may have both beneficial effects and adverse impacts.

WATER RESOURCES

ELEMENT/AFFECTED INTEREST	PROGRAM IMPACTS (LOCAL)											
	SHORT DURATION						LONG DURATION					
	PROPOSED ACTION						PROPOSED ACTION					
	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
WATER USE	○	○	○	○	○	○	○	○	○	○	○	○
MUNICIPAL USERS	○	○	○	○	○	○	○	○	○	○	○	○
IRRIGATION AND RURAL USERS	○	○	○	○	○	○						
SURFACE WATER HYDROLOGY AND QUALITY	○	○	○	○	○	○	○	○	○	○	○	○

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FIGURE 4.9.2-1 LOCAL IMPACTS TO WATER RESOURCES ASSOCIATED WITH THE PROPOSED SMALL ICBM PROGRAM IN MONTANA

WATER RESOURCES

ELEMENT	NUMBER OF LAUNCH FACILITIES													
	SHORT DURATION							LONG DURATION						
	NOT SIGNIFICANT				SIGNIFICANT			NOT SIGNIFICANT				SIGNIFICANT		
	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH
SURFACE WATER (SEDIMENTATION)	**155**	**39**	**3**	**3**				**200**						

Note: Site impacts at individual launch facilities are illustrated in Figure 4.0-1.

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FIGURE 4.9.2-2 SUMMARY OF SITE IMPACTS TO WATER RESOURCES ASSOCIATED WITH PROPOSED SMALL ICBM CONSTRUCTION AND OPERATIONS AT LAUNCH FACILITIES IN MONTANA

these onbase uses amount to 3,350 acre-ft, accounting for two-thirds of the total program-related water use during the construction phase (Table 4.9.2-1). The program-related, onbase water requirements would increase steadily throughout the construction phase and reach a maximum of 1,320 acre-ft/yr in the operations phase (the year 2000); this includes 150 acre-ft/yr needed for office-related and industrial operations. This peak is almost double onbase baseline water use. Baseline-plus-program onbase water use (Table 4.9.2-2) would amount to 2,780 acre-ft/yr in the operations phase. Since the maximum contract delivery of water from the City of Great Falls to Malmstrom AFB is 1,410 acre-ft/yr, the contract delivery amount would need to be renegotiated. Nevertheless, the utilities analysis (Section 4.2) concludes that the city pipelines serving the base have adequate hydraulic capacity to meet baseline-plus-program water needs at Malmstrom AFB.

Program-related water use at Great Falls, including the water supplied to Malmstrom AFB, would also peak in the operations phase at 1,430 acre-ft/yr; a 10-percent increase over baseline water use in the year 2000. The baseline-plus-program water requirements at Great Falls would amount to 15,490 acre-ft in the year 2000. This amount can easily be obtained from the Missouri River and represents only 21 percent of the city's annual water rights to this river (Table 4.9.2-2). Therefore, the city's water supply would not be seriously affected by the Proposed Action.

Table 4.9.2-1

Program-Related Water Use Within the Malmstrom AFB Region of Influence (acre-ft)

	1990	1991	1992	1993	1994	1995	Construction Phase Total	2000
Malmstrom AFB Use (including construction and operations needs)	10	130	510	740	870	1,090	3,350	1,320
Great Falls Inmigrant Use	140	130	200	180	150	140	940	110
Lewistown Inmigrant Use	0	0	30	20	20	0	70	0
Conrad Inmigrant Use	0	0	0	10	0	0	10	0
Deployment Area Use (including construction and operation needs)	80	90	90	90	80	40	470	30
TOTAL:	230	350	830	1,040	1,120	1,270	4,840	1,460

Table 4.9.2-2

Baseline-Plus-Program Water Use of Major Entities Within the Malmstrom AFB Region of Influence (Values in acre-ft unless otherwise noted)

	1990	1991	1992	1993	1994	1995	Construction Phase Total	2000
Malmstrom AFB	1,470	1,590	1,970	2,200	2,330	2,550	12,110	2,780
Percent of Available Supply[1]	39	42	52	58	61	67	51	73
Great Falls[2]	13,470	13,660	14,180	14,460	14,630	14,920	85,320	15,490
Percent of Available Supply[3]	18	19	19	20	20	20	19	21
Lewistown	2,050	2,060	2,100	2,090	2,100	2,090	12,490	2,130
Percent of Available Supply[4]	49	49	50	50	50	51	50	51
Conrad	540	550	560	580	590	600	3,420	660
Percent of Available Supply[5]	17	17	17	18	18	18	17	20

Notes: [1]Based on a hydraulic capacity of the Great Falls water-delivery system of 3,800 acre-ft/yr.
[2]Includes Malmstrom AFB use.
[3]Based on a total of 73,120 acre-ft/yr of water rights to the Missouri River.
[4]Based on a total of 4,200 acre-ft/yr of water rights to Big Springs.
[5]Based on an average annual entitlement of 3,270 acre-ft/yr from shares in the Pondera County Canal and Reservoir Company.

An additional 70 acre-ft in Lewistown and 10 acre-ft in Conrad would be used by civilian inmigrants during the construction phase. Lewistown would experience a peak-annual increase of 30 acre-ft in 1992. This is only a 1-percent increase over baseline and can be easily supplied by the town's allocated supply at Big Springs (Table 4.9.2-2). Conrad would experience a peak-annual increase of 10 acre-ft in 1993, a 2-percent increase over baseline. This amount can also be easily met by the town's average, annual water entitlement from the Pondera County Canal and Reservoir Company (Table 4.9.2-2).

Program-induced water use in the deployment area would amount to 470 acre-ft over the construction phase, peaking at 90 acre-ft/yr in 1991 (Table 4.9.2-1). Most of this water would be used for aggregate washing, soil compacting, concrete batching, dust control, and revegetation. The proposed program contractors would be responsible for obtaining the water needed during the construction phase and can be expected to seek the least expensive sources available. It is likely that most construction water would be taken from sources located some distance from the actual construction sites. Some

construction water may be supplied by municipalities such as Conrad, which currently supplies domestic water to many outlying ranches. During the operations phase, 30 acre-ft/yr would be used at 100 launch facilities. This water would be trucked from nearby towns and/or private sources. The amount of water needed in the deployment area is relatively small and its use would have a generally minor effect on most potential supply sources. Therefore, the overall effect on agricultural irrigators and rural water users would generally be minor. However, some of this water may be withdrawn from water-short areas (Section 3.9.3, Figure 3.9.3-5). This may require the purchase or lease of existing water rights of irrigators or other water-rights holders. Such water-rights holders would be fairly compensated for the use of their water.

In summary, the Proposed Action domestic water requirements by both civilian and military inmigrants would amount to about 3,990 acre-ft during the construction phase, while construction-plus-operations water needs would amount to 870 acre-ft for the same period. Total construction-phase water requirements would amount to 4,860 acre-ft. Water use associated with the proposed program operation is estimated at 1,460 acre-ft/yr. Almost 90 percent of this amount is accounted for by domestic water requirements; most would be used at Malmstrom AFB. The water supplies of towns in the ROI are adequate to meet future baseline-plus-program water demands. No major water users are likely to be adversely affected by program-related water use. No changes in water use trends are likely to result from the proposed program other than some temporary leasing of local water rights. No change or acceleration of future development plans by major users would be necessary, and the proposed program would not affect the cost of water to existing major users. For the Proposed Action, the overall short- and long-duration water use impacts would therefore be low and not significant.

Housing Option H1. Great Falls has a slightly higher per capita water use than Malmstrom AFB. Consequently, the effect of building the new housing facilities offbase would slightly increase program-induced water requirements for the Great Falls metropolitan area. This would result from the shift in domestic water demand from Malmstrom AFB to Great Falls. Housing Option H1 would increase program-related water use over Proposed Action water requirements by 30 acre-ft during the construction phase and by 30 acre-ft/yr during the operations phase. These amounts of additional water use can easily be met by the City of Great Falls. The water use impacts would therefore remain the same as those of the Proposed Action.

Housing Option H2. Program-related water use would increase by 60 acre-ft during the construction phase and by 60 acre-ft/yr during the operations phase. Water use impacts would remain the same as those for the Proposed Action.

4.9.2.2 Surface Water Hydrology and Quality

Regardless of the 100 launch facilities selected, short- and long-duration impacts on surface water would be low and not significant.

Surface water would be used to supply the program-related water needs in the cities of Great Falls and Conrad. Water use in Great Falls (including Malmstrom AFB), with or without the program, represents only 0.3 percent of the average annual flow of the Missouri River and would not appreciably affect its flow. Conrad is supplied by Lake Frances, an irrigation reservoir. Under baseline conditions the water use at Conrad represents less than 1 percent of the reservoir's available supply in a year of average precipitation. During the peak year (1993) of program-induced use, an additional

0.01 percent of the reservoir supply would be required. This would not appreciably change the hydrology of the reservoir and the irrigation canals it feeds.

For the Proposed Action, peak, program-induced annual increases in wastewater discharges would be 920 acre-ft at Great Falls (including 780 acre-ft generated at Malmstrom AFB), an 8-percent increase (Section 4.2.2). Peak, program-induced effluent discharge form Lewistown would be 10 acre-ft/yr, 0.5-percent increase. A similar peak discharge would occur at Conrad and represents a 2-percent increase for that system. Wastewater discharges are typically evaluated against the 10-year, 7-day lowflow of the receiving water. Under these conditions, effluent from Great Falls and Lewistown would be 0.5 and 5 percent, respectively, of the lowflows of the Missouri River and Big Spring Creek, with or without the program. Insufficient flow records were available to estimate the lowflow of the Dry Fork-Marias River. However, effluent from Conrad would be 5 percent of the average annual flow of the Dry Fork-Marias River, with or without the program. During program operations, Conrad and Lewistown would have no program-related discharges, while program-induced wastewater discharge form Great Falls will be 850 acre-ft/yr. The utilities analysis (Section 4.2) has determined that there is adequate plant capacity to treat the additional effluent to meet discharge standards. Therefore, the water quality in the receiving streams is not likely to be measurably altered because of program-related increases in effluent discharges.

Wastewater generated at the HML shelters during program operations would be collected in holding tanks and trucked away periodically by private contractors. The wastewater would be delivered into municipal wastewater systems with which the contractor has agreements for treatment and discharge. Therefore, water quality would not be adversely affected by wastewater generated in the deployment area because of proposed program operations.

Surface water would likely be used to supply the majority of the construction and operations-phase program-related water in the deployment area. The water requirements would be fairly evenly distributed across the deployment area. The peak water requirements would occur in 1991. The 90 acre-ft of water needed in this year represents less than 0.01 percent of the streamflow within the ROI and should have a generally low effect on streamflow. However, construction water use in the summer could contribute to the desiccation of some of the smaller streams, locally.

Most of the proposed program impacts on surface water are expected to be short-duration declines in water quality (primarily increases in sedimentation and associated turbidity) associated with construction at the launch facilities, road upgrades, and bridge replacements along transporter/erector (T/E) routes. In those locations where ground disturbance occurs in the vicinity of streams or lakes, increased sedimentation is likely to result from grading and excavation activities and exposed-soils erosion. The extent of this impact would vary with the type and season of construction activity.

The most pronounced water quality degradation would occur from bridge and road-approach construction at perennial-stream crossings. Grading, excavation, heavy-equipment operation, and other disturbance in the floodplain and along the streambank would directly introduce sediment into the stream, temporarily raising suspended-solids concentrations to extremely high levels. The general pattern of site-specific water quality impact is apparent from the few studies of the effects of bridge and culvert construction. A sudden and very transient increase in turbidity would occur immediately following commencement of construction activity between the streambanks. Suspended-sediment levels may increase to tens of thousands of milligrams per liter (mg/l). These

very high sediment levels would occur through the duration of bank or streambed disturbance activities, but would rapidly diminish upon completion of construction at the crossing. Given baseflow conditions in the stream, suspended-sediment concentrations would return to near-background levels within a few days. In the initial period following bridge construction, elevated turbidity would be noticeable for a considerable distance downstream, depending upon average stream velocity and intervening inflow of other streams.

For a period ranging from several months to approximately 1 year after construction, increased erosion and sedimentation from disturbed areas in the vicinity of streams is expected to occur during periods of storm runoff. Standard stabilization and revegetation measures would reduce program-related sedimentation from storm runoff to levels experienced before construction within a period of about 1 year in most cases.

During proposed program construction, up to 79 bridges that cross drainages could be reconstructed or replaced. Of these, 35 lie across perennial streams (Figure 4.9.2-3). These streams are special because water quality impacts may be unavoidable. Eighteen of these 35 bridges lie over streams that are classified as B1: a coldwater fishery suitable for municipal water supply. Their sensitivity to water quality degradation resulting from sedimentation is reflected by stringent state regulations that limit man-induced increases in turbidity to 5 Nephelometric Turbidity Units (NTUs) above their natural turbidity level. During proposed program construction, this would be greatly exceeded for a short period of time downstream of each bridge replacement, as previously discussed. Montana water quality regulations allow for temporary degradation associated with construction activity by issuing a short-term exemption from surface water quality standards resulting from construction activity (Administrative Rules of Montana 16.20.633[3]). With standard streambank stabilization measures and revegetation of disturbed areas, the short-duration surface water impacts of isolated bridge replacements would be low to moderate. However, there are several areas where construction of more than one bridge would occur within the same stretch of a B1 stream. If bridges are constructed simultaneously, there would be a potential for turbidity impacts to superimpose and therefore affect considerably longer lengths of stream than would result from a single bridge. These areas include the following:

- Six bridges along a 31-mile stretch of upper Ross Creek and its tributaries, north of Judith Gap;
- Three bridges on the lower 3 miles of Mill Coulee Creek just above its confluence with the Sun River near the Town of Sun River;
- Three bridges over Little Rock Creek (just west of Lewistown) and a tributary, King Coulee Creek, all within 5 miles of each other; and
- Two bridges along an 8-mile stretch of Sand Coulee Creek, south of Great Falls.

Should construction proceed simultaneously at more than one bridge at these locations, short-duration, high impacts to water quality of the affected streams would occur. Multiple-bridge construction would also occur along several streams with lower water quality classifications. These include Warm Springs Creek, a C3 stream (warmwater fishery and marginal for agricultural and industrial supply) having three bridges within an 8-mile stretch; and the upper portion of the Dry Fork-Marias River, a B2 stream with two bridges that are 5 miles apart on two adjacent tributaries. Given their lower water quality classifications, short-duration impacts to these streams from simultaneous bridge

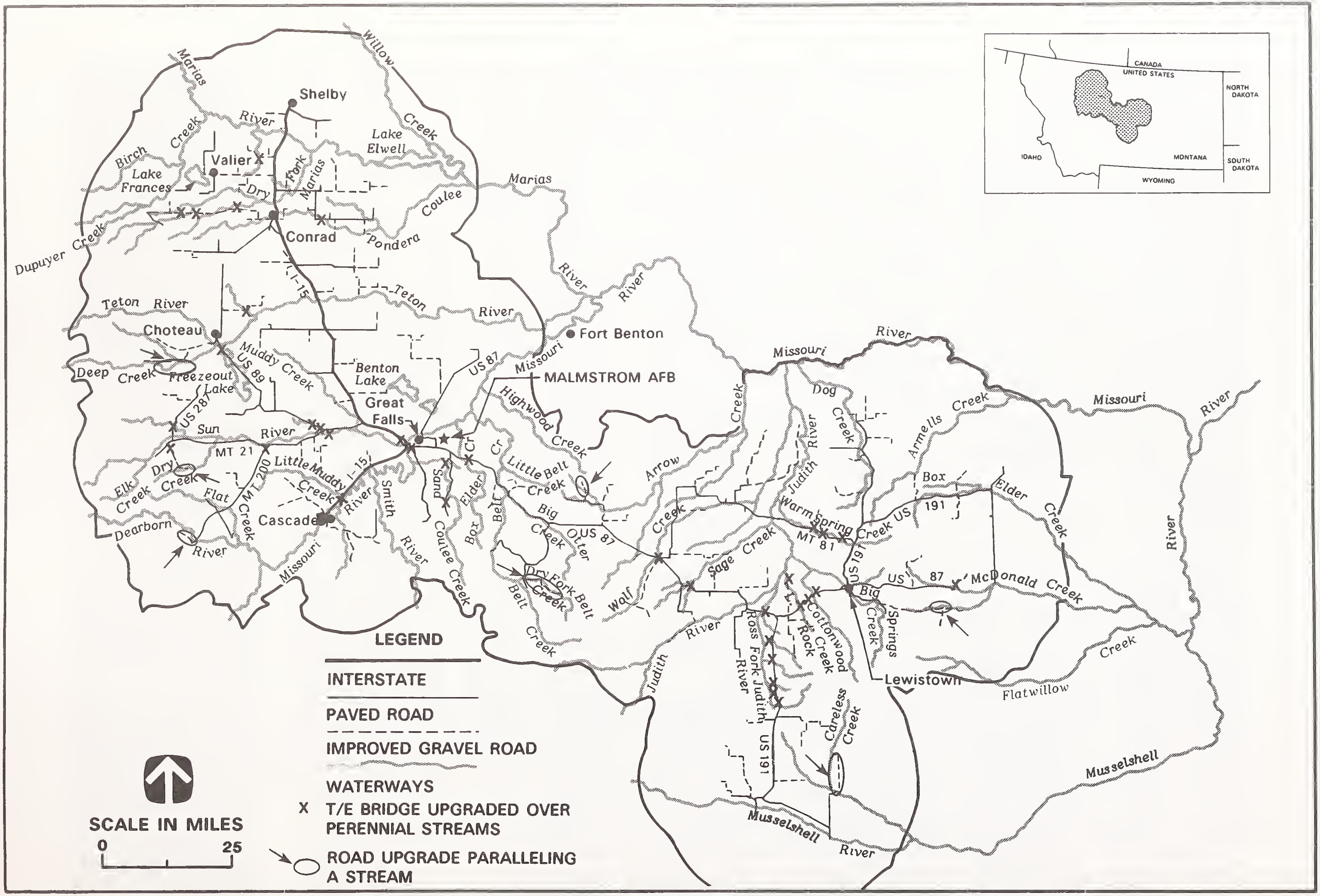

FIGURE 4.9.2-3 LOCATIONS OF POTENTIAL STREAM IMPACT DURING UPGRADES OF TRANSPORTER/ERECTOR ROADS AND BRIDGES

EM4-WR/2

construction are rated moderate. The severe water quality degradation associated with bridge construction would in each case be of very short duration and would have almost no lasting effects. Therefore, these impacts would not be significant.

For the 44 bridge upgrades over intermittent streams, the high, transient sedimentation occurring during actual bridge construction can be avoided. If construction occurs during periods of little or no flow in the stream, downstream water quality impacts would be limited to infrequent periods of stormwater runoff until stabilization and revegetation measures have taken effect.

Surface water impacts would occur due to road construction in the deployment area. This would result from accelerated erosion and resulting sedimentation occurring in the disturbed road corridor. Up to 1,100 acres could be disturbed along roads, that have been identified for possible improvement in the deployment area. Most of this temporary land disturbance would occur at distances of greater than 1 mile from perennial streams, resulting in little impact to water quality. However, there is potential for road construction to occur along some T/E routes which run parallel to, and in close proximity (within 0.5 mile) with, a stream. The potential for sedimentation and resulting water quality declines would be greatest in these instances and is summarized in Table 4.9.2-3. Short-duration, high, site impacts to water quality would occur to those Class B1 streams with the longer lengths of parallel road upgrades: Careless Creek, Dry Fork-Belt Creek, and Deep Creek. Short-duration, site impacts would be moderate and occur in the remaining four streams. In all cases, the long-duration water quality impacts would be negligible after revegetation.

Water quality impacts from construction at the launch facilities would be of the same character as those discussed for road construction. A land disturbance of approximately 3 acres would occur within and around each of the 100 selected launch facilities. Depending upon slope and local drainage characteristics, noticeable increases in turbidity would be limited primarily to those launch facilities lying in the vicinity of perennial streams. Approximately three-quarters of the launch facilities (155) lie at a distance greater than 1 mile from the nearest perennial streams (or greater than 0.5 mile from Class C3 streams). Disturbance at these sites would not affect site impacts on water quality. Therefore, impacts on water quality from construction at these sites would be negligible.

Thirty-nine launch facilities are located at distances that vary from less than 0.25 mile to a Class C3 stream to between 0.05 to 1 mile to a Class B1 stream. Short-duration, site-level water quality impacts resulting from launch facility construction at these sites would be low (Figure 4.9.2-2). Three launch facilities (H-7, L-6, and M-11) are located from 0.2 to 0.5 mile from Class B1 streams. Close proximity and/or considerable slope and direct site drainage characteristics indicate the possibility for moderate, local impacts on water quality if any of these launch facilities are used for HML deployment.

Finally, three launch facilities, A-5, A-6 and G-10, lie within 250 to 700 feet of Class B1 streams. Construction at these launch facilities has a high probability of direct stream disturbance and substantial sedimentation from the construction site into highly sensitive streams. Increased sedimentation would persist until revegetation around the launch facility has occurred. Therefore, the short-duration, local impacts on water quality would be high. Analysis indicates that the quantities of sediment delivered to the streams during the recovery period after construction are unlikely to raise the average turbidity by more than the permissible 5 NTUs. Therefore, none of these impacts would be significant. Following construction, slightly increased site runoff can be expected because of the additional 1.6 acres of permanently developed area created at each launch facility. This runoff would have a negligible impact on the surface-drainage system.

Table 4.9.2-3

Stream Segments That Parallel Transporter/Erector Routes to be Upgraded

Stream	Classification	Length (mi)	Average Separation (mi)
Careless Creek	B1	6	0.5
S.F. McDonald	C3	0.5	0.1
Dry Fork-Belt Creek	B1	9	<0.1
Tributary to Upper Arrow Creek	C3	2.5	0.1
Middle Fork-Dearborn River	B1	1	0.1
Dry Creek (Sun River)	B1	1.5	0.2
Deep Creek	B1	5	0.1-0.25
TOTAL:		25.5	

The land use analysis (Section 4.4) concluded that no major commercial or housing construction is likely to occur in Conrad and Lewistown. No program-induced construction would occur in either of these two cities. Therefore, the drainage impacts within these two cities would be negligible. However, in Great Falls, several program-related activities would occur that could change local drainage conditions. Considerable construction would occur at Malmstrom AFB for new proposed program facilities and associated onbase housing. A total of approximately 1,160 acres of land would be developed. This includes 600 acres of land that would be used as a HML vehicle operations training area with associated roads, buildings, and compacted driving courses. Such activities would increase the amount of storm runoff.

A computerized stormwater runoff analysis was conducted for Malmstrom AFB and the adjacent area using the runoff model, TR20. The results indicated that the system of unnamed coulees which drain most of the base north, directly to the Missouri River (Figure 4.9.2-4), would experience an increase in peak stormwater flow (due to a 10-year, 2-hour storm) of 6 percent over the baseline condition, which is currently estimated to be nearly 830 cubic feet per second (cfs). Most of this increase in storm runoff is attributable to military housing that would be constructed at the northwest corner of the base. Runoff from this new housing would also boost peak stormwater flows in a smaller coulee flowing northwest of the base by 17 percent (Figure 4.9.2-4) to a total of nearly 200 cfs. There is very little development north of the base and these increases in storm runoff are not expected to cause any substantial damage. But the higher flows would likely increase coulee erosion and resulting sedimentation to the Missouri River. Minor channel modifications and/or increased downstream culvert capacity may be necessary. The soils analysis (Section 4.10.2.3) indicates that during the operations phase, the HML vehicle operations training area is expected to experience a high degree of erosion. This erosion would result in considerable local increases in sediment carried to the nearby Missouri River during periods of storm runoff, particularly if the HML training area is located within the steeper coulee area at the northeast corner of the base. The

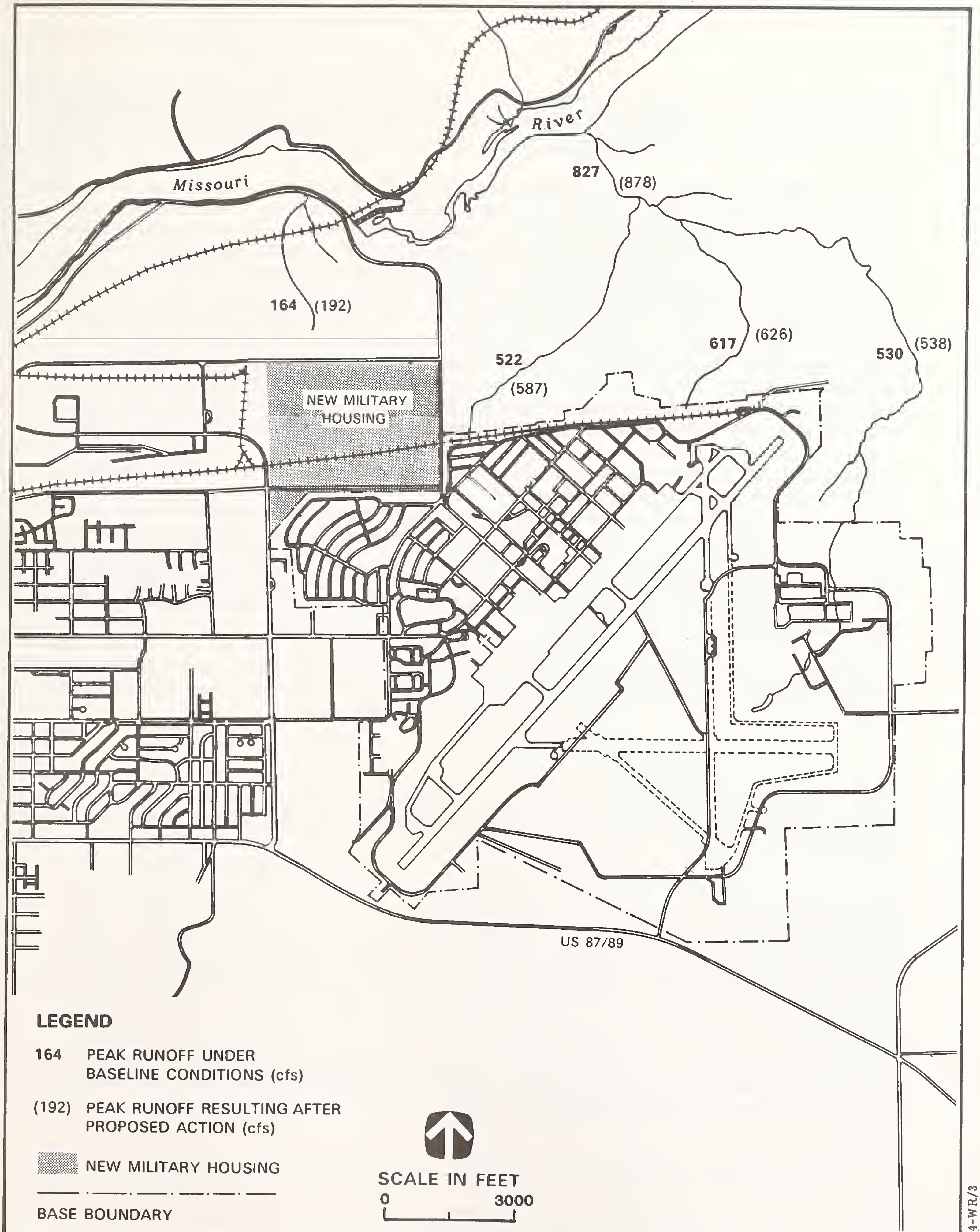

FIGURE 4.9.2-4 PROGRAM-INDUCED INCREASES IN STORMWATER RUNOFF FROM MALMSTROM AFB

long-duration, site impacts at Malmstrom AFB are rated as moderate and not significant. There would be very little program-induced change in the amount of runoff flowing south from the base into Sand Coulee Creek.

With the Proposed Action, program-induced water withdrawals would only have a minor impact on streamflow in the ROI. Additional program-induced wastewater discharges should have no measurable effect on water quality. Construction-phase impacts in the deployment area on the water quality of streams would be low, regardless of which 100 launch control facilities are selected. Therefore, the proposed program would have overall short- and long-duration, low, and not significant surface water impacts. Should bridge construction proceed simultaneously on one or more of the Class B1 streams discussed, short-duration, moderate to high, and not significant site impacts would occur. Some short-duration site impacts on water quality would be moderate to high and not significant because of construction at six launch facilities and along 25 miles of T/E routes that parallel B1 streams in the deployment area. Finally, moderate, not significant, site impacts would result due to increases in storm runoff from Malmstrom AFB.

Housing Option H1. The only surface water impact from Housing Option H1 would be a reduction in stormwater runoff from Malmstrom AFB as compared to the Proposed Action. Peak runoff to the coulee system draining water to the Missouri River would increase by 4 percent while runoff to the isolated coulee northwest of the base would increase by 7 percent. This level of flow increase is unlikely to require the upgrading of downstream drainage structures. The long-duration, site impact is therefore rated as low and not significant. Overall impacts to surface water resources remain the same as for the Proposed Action.

Housing Option H2. If no new housing is built at Malmstrom AFB, increases in peak stormwater runoff from the base would be limited to 1 to 2 percent over baseline. The impacts would be the same as discussed under Housing Option H1.

4.9.2.3 Groundwater Hydrology and Quality

Overall short-duration impacts to the groundwater resources would be low and not significant while long-duration impacts would be negligible. None of these impacts would be significant.

Given the presence of an adequate source of good quality surface water in the vicinity of Malmstrom AFB, groundwater resources would play a secondary role in supplying program-related water requirements. Proposed Action groundwater use is likely to occur only in the deployment area to supply construction and operations-phase water requirements where no dependable surface water sources are available. Groundwater sources would also supply the domestic use of program-induced inmigrants to the City of Lewistown, since the city obtains its water from Big Springs. Peak, program-induced withdrawals at Lewistown would be 30 acre-ft in 1992. This represents 0.04 percent of the average annual flow of the springs. Therefore, program-induced water withdrawals at Lewistown would not have an appreciable effect on the flow of Big Springs. No program-related groundwater withdrawals would occur in the towns of Great Falls or Conrad.

Groundwater pumpage to support construction and operations in the deployment area would be, at most, no greater than 470 acre-ft over the 6-year construction phase and 30 acre-ft/yr during the operations phase. These withdrawals would be spread across the deployment area and represent an increase of only 0.3 percent over the baseline ground-

water pumpage of the ROI. Since the ROI is not projected to experience any substantial groundwater overdraft problems over the baseline, program-induced groundwater pumpage is not expected to seriously affect the groundwater resources of the ROI.

The additional 1.6 acres of permanently devegetated land surface at each launch facility where construction occurs would contribute additional recharge to the shallow groundwater system around the site and may intensify a nearby saline-seep problem. At the ROI level, the effect of this additional (essentially) fallow land would not be significant when compared to the much larger acreage that has historically been left fallow by farmers on a rotating basis. However, there are 18 launch facilities located within 0.5 mile of existing saline seeps (Figure 4.9.2-5). An additional 1.6 acres of permanently devegetated area could intensify an existing saline-seep problem. One-quarter of the launch facilities (50) are located in areas with high saline-seep hazard, but have no existing saline seeps located within a 0.5 mile radius of them. In these cases, the construction of a HML shelter may contribute to the development of a new seep. The remaining two-thirds of the launch facilities (132) are located in areas of low to moderate saline-seep hazard with no saline seeps nearby. Their selection is unlikely to have any effect upon saline seeps. Nearly all of the land disturbance associated with road construction would be temporary and have a narrow, linear shape that contributes little additional recharge to the local groundwater system. Therefore, road construction would have a negligible effect on saline seep.

Housing Options H1 and H2. Saline seep is not a problem in the Great Falls area and is therefore not a factor in the housing options. Additionally, the housing options are inconsequential in a groundwater resources context because no groundwater use would take place in the Great Falls metropolitan area. Therefore, the impacts to groundwater for Housing Options H1 or H2 would be the same as those discussed for the Proposed Action.

4.9.3 Impacts of Alternatives

The overall impacts on water resources from Alternatives 1, 2, and 3 are substantially the same as those for the Proposed Action. Short-duration impacts on all elements would be low. Long-duration impacts on water use and surface water hydrology and quality would also be low, while long-duration impacts on groundwater hydrology and quality would be negligible. None of these impacts would be significant.

4.9.3.1 Water Use

Water use for Alternatives 1, 2, and 3 are similar in both magnitude and category to that of the Proposed Action (Table 4.9.3-1). In all cases, domestic water use by military and civilian inmigrants would account for nearly 90 percent of program-related water requirements.

Alternative 1. This alternative would require less water than the Proposed Action because of the smaller number of personnel required for proposed program operations and the smaller amount of construction water requirements. Total water use for Alternative 1 would amount to 3,990 acre-ft during the construction phase and to 1,040 acre-ft/yr during the operations phase. These amounts represent 17 and 29-percent decreases, respectively, from the construction and operations-phase water requirements of the Proposed Action.

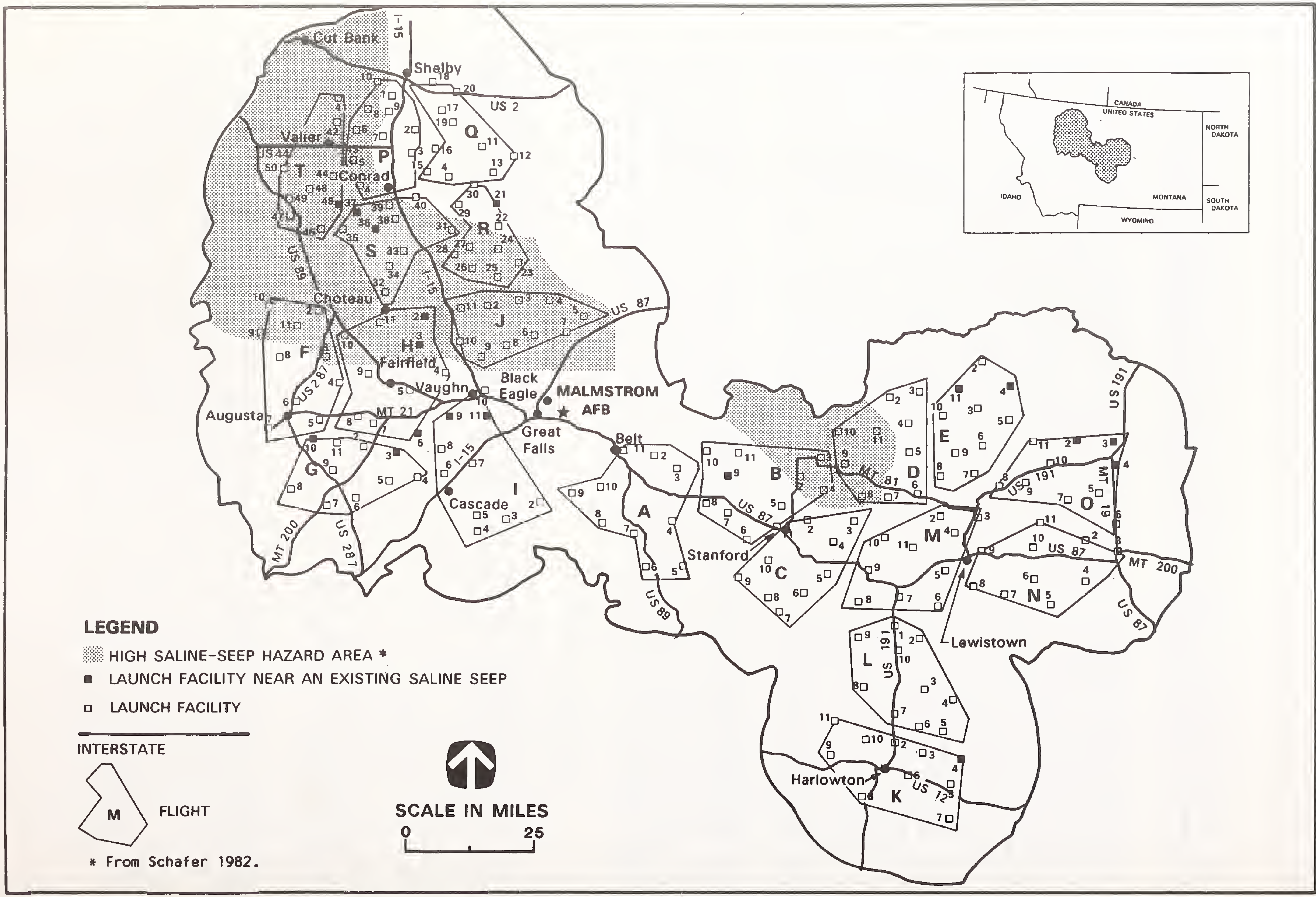

FIGURE 4.9.2-5 HIGH SALINE-SEEP HAZARD AREAS IN THE DEPLOYMENT AREA

Table 4.9.3-1

Program-Related Water Use for the Alternative Deployment Scenarios (acre-ft)

	Proposed Action	Alternative 1	Alternative 2	Alternative 3
Malmstrom AFB Use (including construction and operation needs)	3,350[1] (1,320)[2]	2,660 (930)	3,410 (1,520)	3,350 (1,320)
Great Falls Inmigrant Use	940 (110)	900 (90)	960 (220)	940 (110)
Lewistown Inmigrant Use	70 (0)	70 (0)	110 (0)	70 (0)
Conrad Inmigrant Use	10 (0)	10 (0)	20 (0)	10 (0)
Deployment Area Use (including construction and operation needs)	470 (30)	350 (20)	500 (40)	390 (30)
TOTAL Program Use:	4,840 (1,460)	3,990 (1,040)	5,000 (1,780)	4,760 (1,460)

Notes: [1]Construction-phase total (1989-1995).
[2]Operations-phase annual value.

Alternative 2. This alternative would require more construction water and operations personnel than the Proposed Action. Total water use for Alternative 2 would amount to 5,000 acre-ft over the construction phase and to 1,780 acre-ft/yr during the operations phase, or 3 and 22-percent increases, respectively, over the construction and operations-phase water needs of the Proposed Action. The increase in water use at Malmstrom AFB for Alternative 2 can be adequately supplied by the City of Great Falls.

Alternative 3. This alternative would require virtually the same number of program personnel and the same amount of water use as the Proposed Action.

The available water supply of the major affected entities would not be seriously affected by the program-related water requirements of Alternatives 1, 2, or 3. Construction and operations water use in the deployment area and domestic water use at Lewistown and Conrad for Alternatives 1, 2, and 3 would differ little from the Proposed Action. Therefore, the overall impacts to water use for Alternatives 1, 2, and 3 would be the same as for the Proposed Action. Short- and long-duration impacts would be low and not significant.

4.9.3.2 Surface Water Hydrology and Quality

At the site level, the difference in water quality impacts among Alternatives 1, 2, and 3 is related to the number of launch facilities where the construction would take place. The impacts resulting from bridge upgrades and road widening associated with Alternatives 1, 2, and 3 would be identical to those described for the Proposed Action (Section 4.9.2.2) since the same T/E route upgrades are involved.

Alternative 1. This alternative would have the same impacts as the Proposed Action. During the operations phase, Alternative 1 would result in 410 acre-ft/yr less diversion from the Missouri River than the proposed program. If Alternative 1 is chosen, program-induced effluent discharges from Great Falls to the Missouri River would decrease by 28 percent to 610 acre-ft/yr during the operations phase.

Alternative 2. This alternative involves construction at 125 launch facilities and would probably result in more moderate and high, not significant, site impacts. Alternative 2 would result in the diversion of 310 acre-ft/yr more water from the Missouri River than the Proposed Action during the operations phase. Program-induced effluent discharge to the Missouri River would increase by 9 percent to 1,050 acre-ft/yr during the operations phase.

Alternative 3. This alternative involves construction at all 200 launch facilities and the full range of site impacts summarized in Figure 4.0-1 would occur. Water diversion would be almost identical to that of the Proposed Action. No change in effluent discharge from the proposed program would occur if Alternative 3 is selected.

Neither Alternatives 1, 2, nor 3 would appreciably change the amount of deployment area water diverted for construction or operations. Given an average annual flow of approximately 6 million acre-ft/yr, the impacts to the hydrology and quality of the Missouri River would not be substantially different for Alternatives 1, 2, and 3. Alternatives 1, 2, and 3 would have minor, overall water quality impacts which are substantially the same as those discussed for the Proposed Action. Therefore, the overall impacts of Alternatives 1, 2, and 3 on surface water hydrology and quality would be identical with that of the Proposed Action. Short- and long-duration impacts would be low and not significant.

4.9.3.3 Groundwater Hydrology and Quality

Alternatives 1, 2, and 3 have practically the same effect as the Proposed Action on the groundwater resources of the ROI because groundwater would be secondary in supplying the program-related water requirement. In addition, differences in groundwater pumpage between Alternatives 1, 2, and 3 and the Proposed Action are relatively small, varying by no more than 10 acre-ft/yr.

Alternative 1. Groundwater withdrawals from Big Springs to support domestic water needs of program-induced inmigrants to Lewistown would be the same as those for the Proposed Action.

Alternative 2. This alternative would require only an additional 40 acre-ft over the 7-year construction phase than that of the Proposed Action. This would not have an appreciable effect on the flow of Big Springs.

Alternative 3. Groundwater withdrawals from Big Springs to support domestic water needs of program-induced inmigrants to Lewistown would be the same as those for the Proposed Action.

Alternatives 2 and 3 would involve construction at a greater number of launch facilities than for the Proposed Action. Site-level effects upon saline seep are therefore likely to be greater for these alternatives. Since Alternative 3 would result in the enlargement of all 200 launch facilities and the full range of potential saline-seep effects discussed in Section 4.9.2.3 would occur. At the regional level, the saline-seep effects of all alternatives are very small and not substantially different from those of the Proposed Action. Therefore, the overall groundwater ratings for all three alternatives are the same as those of the Proposed Action: short-duration, low, and significant impacts and and long-duration, negligible impacts.

4.9.4 Cumulative Impacts

4.9.4.1 Water Use

Concurrent deployment of the Peacekeeper in Rail Garrison program and the Proposed Action would require additional amounts of water. Water requirements for Peacekeeper in Rail Garrison would amount to 520 acre-ft over the construction phase and 140 acre-ft/yr during the operations phase. These amounts represent a 10-percent increase over the corresponding water requirements of the Proposed Action and contribute to a cumulative total water use of 5,360 acre-ft during the construction phase and 1,600 acre-ft/yr during the operations phase. Almost all of this additional water use would occur at Malmstrom AFB, where water needs would increase steadily throughout the construction phase and reach a peak of 1,440 acre-ft/yr in the operations phase. This peak is 9 percent higher than the corresponding peak experienced under the Proposed Action alone. Total water use at the base would be 2,900 acre-ft/yr. The Great Falls water supply system to the base has adequate hydraulic capacity to handle the cumulative water demands. Baseline-plus-cumulative water requirements at Great Falls, including Malmstrom AFB water use, would reach a peak of 15,630 acre-ft/yr in the year 2000. This peak is only 1 percent higher than the corresponding peak experienced under the Proposed Action alone, and it represents 21 percent of the city's entitlement to the Missouri River. Therefore, the impacts on water use for the Peacekeeper in Rail Garrison and the Proposed Action would be the same as for the Proposed Action. Cumulative short- and long-duration impacts would be low and not significant.

4.9.4.2 Surface Water and Hydrology and Quality

There would be no additional surface water impacts in the deployment area resulting from the Peacekeeper in Rail Garrison program. As discussed, water diversions from the Missouri River at Great Falls would not increase substantially over those resulting from the Proposed Action. Effluent discharges from Great Falls during the operations phase would increase by only 90 acre-ft/yr over that of the proposed program. Neither of these effects would measurably change the surface water hydrology or quality conditions over those experienced as a result of the Proposed Action. At the site level the Peacekeeper in Rail Garrison program would be located in the relatively undeveloped south-central portion of Malmstrom AFB. Only about 10 to 15 acres of land would be physically altered by the program. This would result in no appreciable change in stormwater runoff or sedimentation from this area of the base.

Overall, the Peacekeeper in Rail Garrison program would not substantially change the surface water impacts resulting from the Proposed Action. Therefore, the short- and long-duration cumulative impacts on surface water resources would remain low and not significant.

4.9.4.3 Groundwater Hydrology and Quality

Deployment of the Peacekeeper in Rail Garrison program at Malmstrom AFB would be inconsequential in a groundwater resources context because this mission would only affect the Great Falls metropolitan area, which obtains all of its water from the Missouri River. Therefore, no groundwater would be used to supply the program-related water requirements of the Peacekeeper in Rail Garrison. The cumulative impacts on the groundwater resources would be the same as those of the Proposed Action. Cumulative short-duration impacts to the groundwater resources would be low, and cumulative long-duration impacts would be negligible. These impacts would not be significant.

4.9.5 Impacts of the No Action Alternative

In the absence of the Small ICBM program, water resource development and use will be as described in the future baseline discussions of the individual elements (Section 3.9.3). At the ROI level, adequate water is generally available to meet most nonagricultural needs. Agricultural water use will continue to fluctuate on an annual basis in response to market conditions and available water. However, overall use for irrigation will probably not change greatly over that of the last decade. The State of Montana will considerably expand the number of streams in the Missouri Basin which have been assigned minimum flows for the preservation of aquatic habitat. This measure should protect these streams from future depletion. Groundwater development within the ROI may accelerate as unappropriated surface water becomes increasingly scarce. Groundwater use will increase, particularly as a supplemental source of irrigation water in water-short basins. At the local level, municipal water use at Great Falls will increase at a moderate pace and will be easily met by the available supply.

4.9.6 Potential Mitigation Measures

Potential mitigations are measures that could be undertaken to reduce or eliminate program impacts. All, some, or none of the measures identified for water resources may be implemented. For each measure, the agency that may be responsible for implementation is identified. The Air Force would encourage implementation of these measures through environmental awareness and other programs. Potential mitigation measures for water resources include the following:

- Minimize the area of construction disturbance and, where practical, avoid the construction of steep embankments in close proximity to streams; for construction occurring along roads closely paralleling streams, confine the disturbed area to the side of the road lying away from the stream (where feasible). This measure would help minimize local sedimentation and water quality degradation in the deployment area (U.S. Air Force and the Montana Department of Highways).

- Apply sediment retention measures until post-construction stabilization measures have taken effect for the six launch facilities identified in Section 4.9.2.2 as having short-duration, moderate to high impacts. Other temporary erosion control measures that would help to protect water quality are discussed in Section 4.10.6 (U.S. Army Corps of Engineers).

- Preliminary analysis of the storm runoff impacts of the Proposed Action indicates that construction of new military housing north of the railroad tracks bordering the base has the potential of substantially increasing peak flows. Stormwater detention facilities should be considered in the design of the military housing site. This would help to avoid increased streambank erosion in the coulees that drain the base to the Missouri River. A sediment retention pond located at the downstream end of the HML vehicle operations training area would avoid potential increases in sediment load which would otherwise result from program operations in this portion of the base (U.S. Air Force).

- Schedule the upgrades of bridges that cross intermittent streams for periods when the streams are not continuously flowing (normally the summer and fall seasons) to minimize downstream water quality impacts (Montana Department of Highways).

- Avoid, where possible, simultaneous improvements to nearby bridges crossing the same perennial stream to minimize multiple streambed disturbance and sedimentation impacts (Montana Department of Highways).

4.9.7 Irreversible and Irretrievable Resource Commitments

The program would require 1,460 acre-ft/yr of water during program operations, nearly all of which would be diverted from the Missouri River at Great Falls. The diversion, partial depletion, and return of the remainder (as treated effluent) would have a very small effect upon the hydrology and quality of the river and its downstream users. Water is a renewable resource. Should program operations cease, this water would be available for other use. The water quality impacts of program construction are mostly of short duration and would not permanently change the availability or quality of the resource from baseline conditions. Therefore, the program would not result in any irreversible or irretrievable commitment of water resources.

4.9.8 Relationship Between the Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The proposed program would not appreciably affect the availability of water resources for other purposes and would therefore not adversely affect the long-term productivity of the region. At the site level, launch facility construction may intensify existing saline seeps or contribute to the emergence of new ones. To the extent that this occurs, groundwater quality and agricultural production would be reduced locally.

4.10 Geology and Soils

The construction, deployment, and operation of the Small Intercontinental Ballistic Missile (ICBM) system at Malmstrom Air Force Base (AFB) and in the deployment area would affect the geology and soils environment. The analysis of impacts considers geologic hazards (including seismicity, seismic effects, and mass movements), geologic resources (including aggregate and energy resources), and soil erosion.

4.10.1 Impact Analysis Methodology

The impact analysis methodology for geology and soils involved three separate procedures: evaluation of program impacts, determination of levels of impact (LOI), and determination of the significance of impacts. The methodology also included consideration of a number of assumptions and assumed mitigations. Impacts were evaluated at the site, and regional levels, and an overall collective assessment was made for each resource element. Site-level impacts address areas where specific construction or land acquisition occurs. Areas potentially affected include a sample of the transporter/erector (T/E) route system where road widening may occur. Construction at a number of bridge sites and launch facilities as well as construction at Malmstrom AFB including housing areas and activities at the Hard Mobile Launcher (HML) vehicle operations area were also considered as potential site-level impacts. Regional impacts are those that affect county or multicounty areas such as those areas considered for aggregate resources.

4.10.1.1 Evaluation of Program Impacts

Program impacts were evaluated by relating program requirements to existing baseline conditions for each of the resource elements considered.

Geologic Hazards. Program effects on seismicity were evaluated by determining what geologic structures are associated with the earthquakes generated in the region. Program activities were evaluated with respect to their potential for accelerating the baseline rate of seismic activity in the region or the potential for the program to be affected by seismic activity in the region.

Program effects on mass movements were evaluated by assessing the geologic conditions at each area to be disturbed by program construction and comparing the conditions to those of active mass movements elsewhere in the Region of Influence (ROI). Known or potential mass movements near program construction activities were evaluated to determine whether the program would reactivate movement of the features based on the type of construction activity and its proximity to the known or potential mass movement. Each of the criteria listed below were used to evaluate the potential for program-induced mass movements at each launch facility and T/E route segment. The first three criteria are considered to be most important in evaluating landslide susceptibility in the ROI.

- Bedrock of the Mississippian/Pennsylvanian Heath and Amsden Formations or Cretaceous shales (predominately the Colorado Group);
- Slopes greater than 10 percent;
- Terrain showing evidence of past mass movement activity;

- Quaternary terrace deposits overlying Cretaceous shale bedrock;
- Presence of glacial lake deposits;
- Presence of springs of other perennial water sources within 0.5 mile; and
- Presence of construction-related bedrock cuts or artificial fill.

Geologic Resources. Program-induced impacts on aggregate resources were evaluated by estimating the amount of aggregate required by the program and comparing that demand to the current production rate, maximum production capacity, and regional supply.

Program impacts to oil and gas resources were evaluated by comparing potential construction sites to areas with known resources. Oil and gas resource areas were identified by the presence of a producing oil or gas well or active lease near program construction areas.

Program impacts to coal resources were evaluated by comparing the location of potential construction sites to areas with known resources as well as program demand for coal related to resource supply and production capacity. Coal resource areas were indicated by the presence of active operations, active leases, or known resource areas.

Soil Erosion. Program impacts were evaluated by determining the erosion susceptibility of soils in the areas potentially disturbed by the program. Soil erosion expected to be initiated by program activities was calculated by application of the Wind Erosion Equation for wind erosion and the Universal Soil Loss Equation for sheet erosion.

4.10.1.2 Determination of Levels of Impact

The LOI is the determination of the magnitude of an impact. The LOI is determined by comparing LOI criteria to the amount of change in baseline conditions attributable to program requirements. Values for several geology and soils elements are not numerically definable and were assessed through the use of professional judgment.

Geologic Hazards. The LOI definitions for geologic hazards are the following:

- Negligible Impact -- The proposed program would not measurably affect the projected baseline rate of natural geologic processes.
- Low Impact -- The proposed program would increase the baseline rate of natural geologic processes which are already occurring, or initiate geologic processes, but these geologic processes are not expected to influence human activities. For example, an increased frequency of mass movements caused by program construction activities may occur outside construction zones in the deployment area (e.g., drainage diverted offsite causing slope failure in adjacent areas).
- Moderate Impact -- The proposed program would increase the baseline rate of natural geologic processes and may initiate new occurrences that could cause detrimental effects to existing structures. For example, program construction that disturbs soil and surficial deposits may result in the initiation of mass movements that could cause minor damage to a road or bridge.

- High Impact -- The proposed program would accelerate the baseline rate of geologic processes and initiate geologic conditions that may cause extensive damage to structures or have long-lasting adverse effects. For example, program-induced mass movements may render roads and bridges impassable or require continued maintenance long after construction has ceased.

Geologic Resources. The LOI definitions for geologic resources (e.g., aggregate and coal) used by the proposed program are the following:

- Negligible Impact -- Program demand would not require existing resource producers to increase current production rates by more than 1 percent. Existing aggregate producers are able to accommodate the program requirements without identifying and exploiting new sources. Program demand would not interfere with the needs of other consumers in the region.

- Low Impact -- Existing producers are able to accommodate program requirements with an increase in the production rate. Program demand plus baseline demand is less than the existing production capacity. Existing producers may be required to identify and exploit new sources to meet peak demand. Program demands may cause a measurable reduction in the supply of the resource for the baseline demand in the local area; however, it would not adversely affect other consumers in the region.

- Moderate Impact -- Existing producers are able to accommodate program requirements with an increase in the production rate. Program demand plus baseline demand approximately equals existing production capacities. Existing producers are not able to accommodate the program demand without identifying and exploiting new sources. Program requirements would reduce the supply of the resource for the baseline demand in the local area resulting in temporary shortages for other consumers.

- High Impact -- Existing producers are not able to accommodate the program demand without identifying and exploiting new sources and may be forced to use sources or processing techniques normally considered unconventional. Existing producers do not have sufficient production capacity to meet baseline plus program demand.

The LOI definitions for energy resources (e.g., oil and gas) not used directly by the proposed program which may be affected through restricted access are the following:

- Negligible Impact -- No measurable changes in access, exploration, development, or production of energy resources due to program-related activities. No mineral, oil, or gas leases are located adjacent to the launch facility.

- Low Impact -- Program-related activities may temporarily interrupt the access, exploration, development, or production of energy resources that are generally considered speculative or hypothetical. Areas leased for oil or gas exploration are located adjacent to the launch facility.

- Moderate Impact -- Program-related activities periodically interrupt the access, exploration, development, and production of energy resources in areas designated as having potentially economic energy resources (e.g., active lease areas), or interfere with the normal procedures of an active operation.

- High Impact -- Program-related activities cause major interruption or elimination of access, resource exploration, development, or production of known active energy resource areas, such as condemnation of oil-or gas-producing fields or elimination of access to active oil-or gas-production areas or mining operations.

Soil Erosion. The LOI definitions for soil erosion impacts are keyed to the maximum tolerable soil loss values developed by the U.S. Soil Conservation Service. Application of these values to the proposed program results in the following:

- Negligible Impact -- Program-induced soil erosion is much less than the maximum tolerable soil loss for all of the proposed construction and operations areas. Program-induced erosion rates are generally much smaller than baseline erosion rates.

- Low Impact -- Program-induced soil erosion would cause adverse effects on the soil; however, the soil loss is still below the maximum tolerable loss. Soil losses that exceed the maximum tolerable loss are restricted to small portions of the construction and operations areas.

- Moderate Impact -- Program-induced soil erosion would cause adverse effects on the soil. Soil loss is expected to approximately equal the maximum tolerable loss for most areas affected by construction and operations disturbances.

- High Impact -- Program-induced soil erosion would cause adverse effects on the soil. Program-induced soil erosion is expected to exceed the maximum tolerable soil loss in large portions of the area disturbed by the proposed program.

4.10.1.3 Determination of Significance

The significance of geology and soils impacts were evaluated in accordance with Council on Environmental Quality (CEQ) regulations. Significance was assessed through evaluation of the context and intensity of the impacts. Context includes consideration of the settings (site, local, or regional) and the duration of the impacts. The CEQ regulations provide ten items that should be considered in evaluating intensity. Of these ten items, the following are applicable to the geology and soils resource:

- The degree to which the proposed action affects public health or safety; and

- The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

In addition to the considerations specifically identified in the CEQ regulations, the following considerations are judged appropriate for geology and soils resources:

Geologic Hazards.

- Program-related construction would result in detrimental effects that continue beyond the life of the program and would require extensive remedial action.

Geologic Resources.

- Whether the program requirements deplete the demonstrated and inferred local and/or regional aggregate supplies;

- Whether the action would cause the removal of appreciable oil, gas, or coal reserves from production; and

- Whether the program aggregate demand would conflict with aggregate resource needs of concurrent programs.

Soil Erosion.

- Whether the long-duration program-induced erosion would remove topsoil at a rate greater than the soils natural regenerative capabilities and would result in an appreciable net loss of topsoil.

4.10.1.4 Assumptions and Assumed Mitigations

A number of program-related assumptions were selected in order to evaluate the site and regional impacts. However, no assumptions were made for geologic hazards because specific construction criteria have not been determined.

The following assumptions were made for aggregate resources:

- Aggregate consumed by the proposed program was derived from existing commercial producers unless their production capacities or reserves did not meet baseline and program demand. New aggregate pits were opened only after the existing producers' reserves are depleted.

- Aggregate supplied to a construction site was derived from the closest existing commercial producer.

- A 30-mile, one-way haul distance from the aggregate producer to the construction site was used as the maximum economical haul distance.

- Construction areas more than 30 miles from an existing commercial producer were serviced by the closest producer. Additional mileage for hauling the aggregate is the preferred alternative to opening new aggregate pits.

- Maximum regional production capacities were assumed to be 125 percent of the regional commercial production rate.

Assumptions used for analyses of oil, gas, and coal include the following:

- All active oil-or gas-production facilities or active coal-mining operations within the expanded explosive safety zones would be compatible with the terms of the easement;

- Oil, gas, or coal exploration would not be restricted in the explosive safety zone; and

- Just compensation would be made for oil and gas interests which must be extinguished to allow launch facility expansion.

Assumptions used in analyses of soil erosion include the following:

- Soil erosion rates for construction activities onbase, at launch facilities, and on T/E routes were computed based on unvegetated ground with maximum slope lengths of the disturbed ground estimated to be 200 feet.

- Ground disturbed as a result of construction activity would be mulched immediately upon completion of construction. The mulch should consist of straw applied at a rate of 1 ton per acre or other materials providing equivalent protection. The mulch would be maintained until new vegetative cover is well established.

- A typical cross-section was used for T/E routes throughout the deployment area. It is assumed this cross-section would be maintained during road construction.

- The HML vehicle operations training area would be continuously disturbed and would remain essentially unvegetated throughout the life of the program.

- A short-duration, annual soil erosion rate of 6.5 tons per acre is the maximum tolerable soil loss.

- Disturbed ground as a result of T/E route or launch facility access road modifications would occur within 20 feet of the edge of the road in the existing right-of-way.

- The amount of time a soil would remain barren, and therefore most susceptible to erosion, was limited to 12 months for T/E routes, construction at the base, and for new housing.

- Launch facility construction activities would disturb about 3 acres at each launch facility for the Proposed Action and Alternatives 1 and 2. Disturbance areas were assumed to be 2 acres per launch facility for Alternative 3.

There are no unique assumed mitigations for the analyses other than that standard construction practices will be used, including dust-suppression techniques and revegetation of temporarily disturbed areas.

4.10.2 Impacts of the Proposed Action

The Proposed Action is not expected to create any long-duration, adverse, significant impacts to geology or soil resources. Long-duration impacts to geologic hazards are expected to be moderate as a result of the potential for mass movements, but not significant at the site level (Figure 4.10.2-1) since none of the adverse effects are expected to continue beyond the life of the program or require extensive mitigation measures. The collective effect of regional impacts to aggregate resources would lead to long-duration, moderate impacts level (Figure 4.10.2-2) as a result of the need to identify additional reserves for future baseline demand. Long-duration, site-level impacts to oil, gas, and coal resources are expected to be negligible or low because a number of oil and leases would be extinguished for the length of the operations phase depending upon the launch

GEOLOGY AND SOILS

ELEMENT	NUMBER OF LAUNCH FACILITIES													
	SHORT DURATION							LONG DURATION						
	NOT SIGNIFICANT				SIGNIFICANT			NOT SIGNIFICANT				SIGNIFICANT		
	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH
GEOLOGIC HAZARDS	113	77	8	2				113	77	8	2			
GEOLOGICAL RESOURCES														
ENERGY RESOURCES	200							138	62					
SOIL EROSION	76	81	10	33				200						

Note: Site impacts at individual launch facilities are illustrated in Figure 4.0-1.

FIGURE 4.10.2-1 SUMMARY OF SITE IMPACTS TO GEOLOGY AND SOILS ASSOCIATED WITH PROPOSED SMALL ICBM CONSTRUCTION AND OPERATIONS AT LAUNCH FACILITIES IN MONTANA

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible	□	
Low	∘	•
Moderate	○	●
High	◯	⬤
Beneficial Effects	▨	

Note: Some resource elements may have both beneficial effects and adverse impacts.

GEOLOGY AND SOILS

ELEMENT/AFFECTED INTEREST	PROGRAM IMPACTS (REGIONAL)											
	SHORT DURATION						LONG DURATION					
	PROPOSED ACTION						PROPOSED ACTION					
	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
AGGREGATE RESOURCES	⬤	⬤	⬤	⬤	⬤	⬤	○	○	○	○	○	○
GREAT FALLS AREA	●	●	●	●	●	●	∘	∘	∘	∘	∘	∘
LEWISTOWN AREA	⬤	⬤	⬤	⬤	⬤	⬤	○	○	○	○	○	○
SHELBY/CONRAD AREA	⬤	⬤	⬤	⬤	⬤	⬤	○	○	○	○	○	○

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FIGURE 4.10.2-2 REGIONAL IMPACTS TO AGGREGATE RESOURCES ASSOCIATED WITH THE PROPOSED SMALL ICBM PROGRAM IN MONTANA

GEOLOGY AND SOILS

ELEMENT	NUMBER OF LAUNCH FACILITIES														
	SHORT DURATION							LONG DURATION						
	NOT SIGNIFICANT				SIGNIFICANT			NOT SIGNIFICANT				SIGNIFICANT		
	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH	NEGLIGIBLE	LOW	MODERATE	HIGH	LOW	MODERATE	HIGH
GEOLOGIC HAZARDS	113	77	8	2				113	77	8	2			
GEOLOGICAL RESOURCES														
ENERGY RESOURCES	200							138	62					
SOIL EROSION	76	81	10	33				200						

Note: Site impacts at individual launch facilities are illustrated in Figure 4.0-1.

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FIGURE 4.10.2-1 SUMMARY OF SITE IMPACTS TO GEOLOGY AND SOILS ASSOCIATED WITH PROPOSED SMALL ICBM CONSTRUCTION AND OPERATIONS AT LAUNCH FACILITIES IN MONTANA

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible	□	
Low	○ (small)	● (small)
Moderate	○ (medium)	● (medium)
High	○ (large)	● (large)
Beneficial Effects	▒ (shaded)	

Note: Some resource elements may have both beneficial effects and adverse impacts.

GEOLOGY AND SOILS

PROGRAM IMPACTS (REGIONAL)

ELEMENT/AFFECTED INTEREST	SHORT DURATION: PROPOSED ACTION: PROGRAMMED HOUSING	SHORT DURATION: PROPOSED ACTION: WITH HOUSING OPTION H1	SHORT DURATION: PROPOSED ACTION: WITH HOUSING OPTION H2	SHORT DURATION: ALTERNATIVE 1	SHORT DURATION: ALTERNATIVE 2	SHORT DURATION: ALTERNATIVE 3	LONG DURATION: PROPOSED ACTION: PROGRAMMED HOUSING	LONG DURATION: PROPOSED ACTION: WITH HOUSING OPTION H1	LONG DURATION: PROPOSED ACTION: WITH HOUSING OPTION H2	LONG DURATION: ALTERNATIVE 1	LONG DURATION: ALTERNATIVE 2	LONG DURATION: ALTERNATIVE 3
AGGREGATE RESOURCES	● (large)	● (large)	● (large)	● (large)	● (large)	● (large)	○ (medium)	○ (medium)	○ (medium)	○ (medium)	○ (medium)	○ (medium)
GREAT FALLS AREA	● (medium)	● (medium)	● (medium)	● (medium)	● (medium)	● (medium)	○ (small)	○ (small)	○ (small)	○ (small)	○ (small)	○ (small)
LEWISTOWN AREA	● (large)	● (large)	● (large)	● (large)	● (large)	● (large)	○ (medium)	○ (medium)	○ (medium)	○ (medium)	○ (medium)	○ (medium)
SHELBY/CONRAD AREA	● (large)	● (large)	● (large)	● (large)	● (large)	● (large)	○ (medium)	○ (medium)	○ (medium)	○ (medium)	○ (medium)	○ (medium)

FIGURE 4.10.2-2 REGIONAL IMPACTS TO AGGREGATE RESOURCES ASSOCIATED WITH THE PROPOSED SMALL ICBM PROGRAM IN MONTANA

facilities selected. Long-duration impacts to soil resources are considered high and significant at the site level only at the proposed HML vehicle operations training area (Figure 4.0-1) due to the removal of soil at a rate greater than the soil's natural regenerative capability resulting in an appreciable loss of topsoil. Long-duration impacts to soil resources are considered negligible elsewhere on the base and in the deployment area as a result of post-construction erosion control and the recovery of vegetation in the construction areas. None of the long-duration impacts are considered significant except for soil erosion in the HML training area.

Short-duration impacts to geologic hazards (mass movements) are expected to be moderate and not significant because the adverse effects are not expected to require extensive mitigation measures at the site level. Short-duration impacts to geologic resources are rated as high because program demand for aggregate would exceed the capacity to produce sand and gravel in the Lewistown and Shelby/Conrad supply areas. Impacts would be significant at the regional level for aggregate as a result of the depletion of demonstrated and inferred aggregate supplies, and negligible for oil, gas, and coal resources at individual sites. Short-duration impacts to soil resources are expected to be high, because many launch facility soils have high erosion susceptibility. Impacts would not be significant due to the promulgation of soil erosion controls after construction is completed at the site level.

Overall impacts to each geology and soils resource element is dependent on the launch facilities used by the proposed program.

4.10.2.1 Geologic Hazards

The proposed program would not affect regional seismicity and seismic effects. In addition, the potential for seismicity to affect the program is remote. Short-duration, not significant impacts to mass movements may occur at some launch facility sites.

Seismicity and Seismic Effects. There are no impacts on seismicity or seismic effects within the proposed program area because no program activities are planned that would affect these geologic conditions (e.g., accelerating the rate of seismic activity).

Seismic activity and seismic effects causing adverse impacts to the program are remote because of low seismicity in the ROI and absence of active faults within the proposed program area.

Mass Movements. Program-related construction along access roads and at launch facilities may cause moderate and high impacts at sites where slopes are already unstable. Impacts at 10 launch facilities are expected to be moderate or high but not significant; however, impacts at 77 launch facilities are expected to be low and not significant, and 113 launch facilities could be selected with negligible impacts. Launch facilities with potentially moderate or high impacts resulting from landslides are found in the Judith River drainage in the eastern portion of the deployment area, along the southern limit of the Highwood Mountains, and along terraces north of the Sun River. In addition, launch facilities located on mountainous terrain in the Big Snowy and Little Belt mountains may have moderate impacts because of the potential for rockfalls at existing or program-initiated bedrock cuts. Low impacts may arise from widening of T/E routes in areas scattered throughout the deployment area including those routes on glacial lakebed sediments north of the Sun River, and in the Highwood, Little Belt, and Big Snowy mountains, where slopes at steep roadcuts are prone to rockfalls. Although impacts to mass movements would be most prevalent during construction, continued

movement may occur on unstable slopes beyond the life of the program; therefore, short- and long-duration impacts would occur.

Short- and long-duration impacts at the base would be negligible because generally level slopes would be affected by program construction. These slopes have a low susceptibility to mass movements.

4.10.2.2 Geologic Resources

Because of program demands for aggregate, overall regional, short-duration impacts to geologic resources are rated as high because program demand for aggregate exceeds the production capacity. These impacts would be significant as a result of depletion of demonstrated and inferred reserves during construction. Long-duration impacts are rated as moderate and not significant because future (hypothetical) regional reserves and production capacity are sufficient to satisfy any foreseeable future regional demand. In particular, short-duration, high, regionally significant impacts may occur for aggregate consumers in the Shelby-Conrad and Lewistown areas. Some short-duration, high impacts may occur at the site level (e.g., oil, gas, and coal resources), depending on launch facility selection. Only negligible to low, short-duration site impacts are expected for energy resources.

Aggregate Resources. Overall short-duration impacts to aggregate resources in the ROI would be high and significant at the regional level. These impacts would result from construction-related production-rate increases that exceed production capacity in the ROI (Figure 4.10.2-3) and the depletion of demonstrated and inferred commercial reserves in certain areas. Long-duration impacts in the ROI would be moderate and not significant at the regional level because adequate supply and production capacity could be developed to fulfill any foreseeable future demand.

Regional, short-duration impacts would be high and significant in the northern and eastern portions of the deployment area, and moderate and significant in the central portion of the deployment area. Regional, long-duration impacts in the northern and eastern portions of the deployment area would be moderate and not significant. Long-duration impacts in the central portion of the deployment area would be low and not significant. Additional impacts to the central portion of the deployment area would result from program requirements at Malmstrom AFB. Aggregate requirements of the housing options were assumed to represent a very small portion of the base construction demand, and neither option would measurably affect the total base program aggregate requirements. Commercial and noncommercial aggregate resources in the various regions are shown in Section 3.10.3, (Table 3.10.3-1). Program demand for the Proposed Action is illustrated in Table 4.10.2-1.

In the northern third of the deployment area, it was assumed that aggregate resources would be supplied by Shelby-Conrad area producers. These producers have a combined annual production rate of 0.59 million tons, and have about 3.78 million tons of demonstrated and inferred reserves (Section 3.10.3, Table 3.10.3-2). Program aggregate requirements from 1990 to 1993 would necessitate production rate increases that exceed the suppliers' estimated maximum capacity. During these years, alternative sources would be required to satisfy program and baseline demand. Program aggregate requirements represent a large fraction of the demonstrated and inferred commercial reserves, and all presently identified commercial reserves would be depleted by the end of 1993. These program effects on aggregate resources in the northern third of the deployment area would result in short-duration, high, and regionally significant impacts. Long-duration impacts would result from the depletion of all commercial demonstrated and

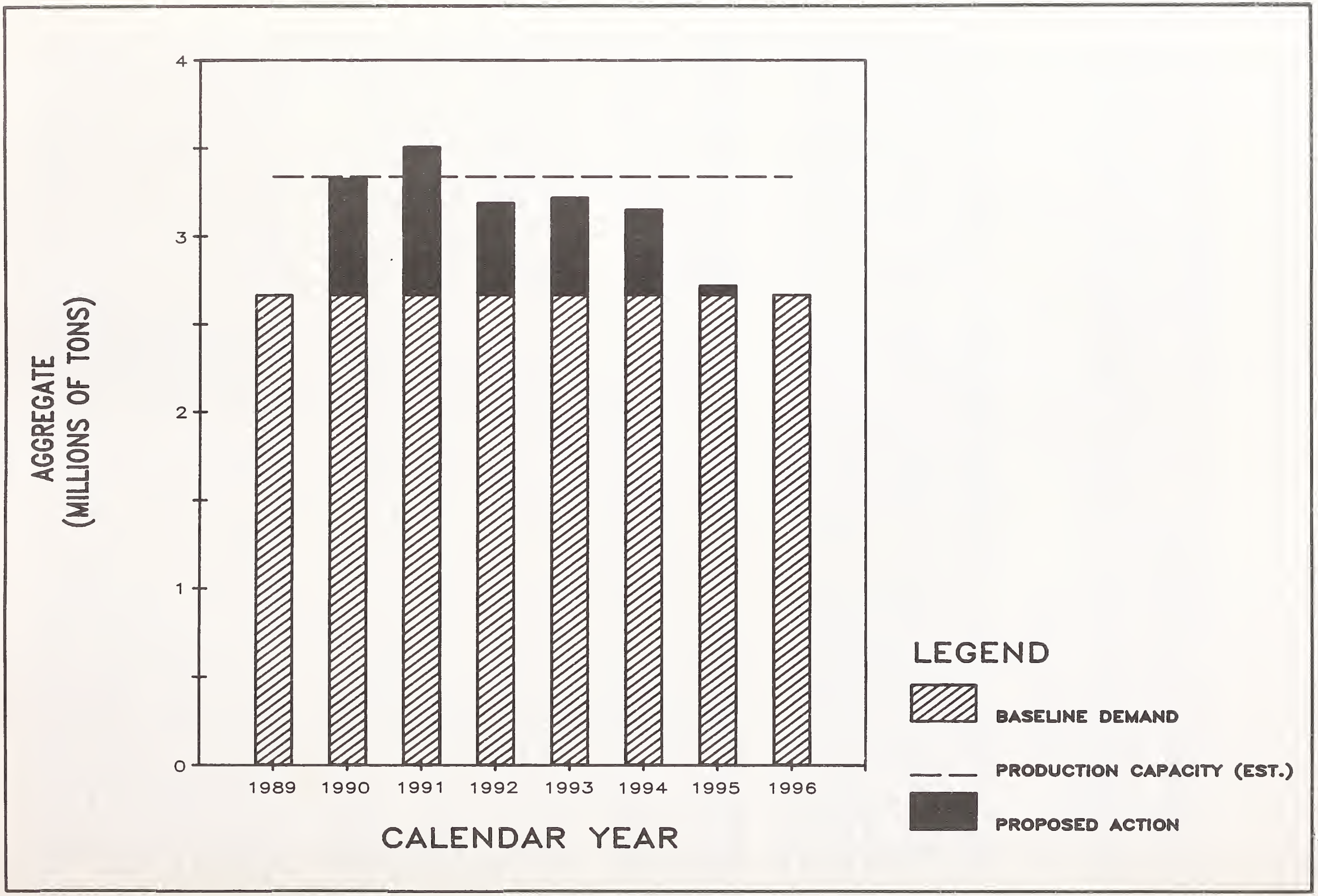

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FIGURE 4.10.2-3 AGGREGATE RESOURCE PRODUCTION IN THE MALMSTROM AFB REGION OF INFLUENCE

Table 4.10.2-1

Program Aggregate Requirements by Calendar Year
(In Thousands of Tons)

Basing Mode	1990	1991	1992	1993	1994	1995	1996	Total
Proposed Action								
Malmstrom AFB	80	190	70	60	80	0	0	480
Deployment Area	590	650	460	470	310	50	0	2,530
TOTAL:	670	840	530	530	390	50	0	3,010
Alternative 1								
Malmstrom AFB	80	170	60	70	60	0	0	440
Deployment Area	590	650	450	470	310	50	0	2,520
TOTAL:	670	820	510	540	370	50	0	2,960
Alternative 2								
Malmstrom AFB	80	200	70	80	80	0	0	510
Deployment Area	590	650	460	470	310	60	0	2,540
TOTAL:	670	850	530	550	390	60	0	3,050
Alternative 3								
Malmstrom AFB	70	180	60	70	70	0	0	450
Deployment Area	470	570	550	480	340	110	0	2,520
TOTAL:	550	750	610	550	410	110	0	2,970

inferred reserves, and are expected to be moderate and not significant at the regional level because sufficient supply and production capacity could be developed to fulfill any foreseeable long-duration demand.

In the eastern third of the deployment area, it was assumed that aggregate resources would be supplied by Lewistown area producers. Production rate data were available for only one producer in the area and the production rate of 0.16 million tons of aggregate per year is extremely conservative. The suppliers here have about 0.78 million tons of demonstrated and inferred reserves. Program aggregate requirements from 1990 to 1994 would require large production rate increases that outstrip the maximum capacity of the suppliers. Alternative sources would be required to satisfy program and baseline demand. Total program aggregate requirements would exceed the currently identified commercial reserves and these reserves would be totally depleted by 1991. These program effects on aggregate resources in the eastern third of the deployment area would result in short-duration, high, and regionally significant impacts. Long-duration impacts would result from the depletion of all presently identified commercial reserves and these impacts are expected to be moderate and not significant because sufficient supply and production capacity could be developed to satisfy any foreseeable long-duration demand.

In the central third of the deployment area, it was assumed that aggregate resources would be supplied by Great Falls area producers. These producers have a combined production rate of 1.92 million tons of aggregate per year and have more than 8 million tons of demonstrated and inferred reserves. Program aggregate requirements would result in relatively large production rate increases and program-plus-baseline demand is less than the suppliers' maximum capacity during the construction phase. Program aggregate requirements represent a relatively small fraction of the demonstrated and inferred commercial reserves. All presently identified commercial reserves, however, would be depleted by the end of 1992. These program effects to aggregate resources in the central third of the deployment area would result in short-duration, moderate, and regionally significant impacts. Long-duration impacts are expected to be low and not significant at the regional level because sufficient future reserves and production capacity could be developed to satisfy any foreseeable long-duration demand. Additional impacts to aggregate resources in the central third of the deployment area would result from program demand at the base.

Program aggregate requirements at the base would result in increased production rates for Great Falls area producers but program demand plus baseline is less than their combined maximum capacity. These program aggregate requirements represent a relatively small fraction of the demonstrated and inferred commercial reserves. The base program effects correspond to short-duration, moderate, and not significant impacts at the regional level. Long-duration impacts are expected to be negligible.

Oil and Gas. Expansion at launch facilities would require termination of current oil and gas leases but would result only in low impacts because exploration or production would not be restricted adjacent to the launch facility and just compensation would be paid for any leases that must be relinquished because of launch facility expansion. Expansion would potentially result in low impacts at 62 sites where active leases occur adjacent to a launch facility (Section 3.10.3, Figure 3.10.3-4) but these impacts would not be significant because the affected oil and gas resources are not an appreciable portion of the state or local reserves. In addition, access to the oil and gas resources would not be restricted (Section 4.10.1.4). Impacts would be negligible at all other launch facilities and along T/E route segments. Long-duration impacts would occur because the restriction of access to expanded areas would continue for the life of the program. Launch facilities where low impacts can be expected are commonly found along the Sweetgrass Arch in the northern portion of the deployment area and along the Sun River, and to a lesser extent near Judith Gap area and on the north side of the Judith Mountains (Section 3.10.3, Figure 3.10.3-4). Oil and gas resources have not been discovered near the base; therefore, program impacts from the Proposed Action and all housing options at Malmstrom AFB would be negligible.

Coal. Short- and long-duration impacts to coal resources in the ROI are expected to be negligible because the proposed program would not interfere with any existing operation or lease and only small amounts of mineable coal have been identified in the ROI. Present demand at Malmstrom AFB is 36,000 tons per year (T/yr). Additional demand for coal as a result of the program is approximately 24,000 T/yr from 1990 to 2010. The program coal demand is a very small percentage of the regional reserves, which include large coal deposits from the Powder River Basin field, southeastern Montana, and eastern Wyoming. Coal for the heat plant at Malmstrom AFB has been purchased in the past from producers in the eastern Montana and Wyoming areas. Coal resources have not been documented near the base; therefore, program impacts from the Proposed Action and all housing options would be negligible. Three coal leases are found directly adjacent to launch facility I-2 south of Great Falls. Long-duration impacts to coal resources at this

site would be low because of the potential removal of this land from coal leasing or restrictions on mining activities adjacent to the launch facility. The impact at this site, as well as all other launch facilities, would not be significant because the coal resources that would be affected are not an appreciable portion of the state or local reserves. In addition, access to the coal resources would not be restricted (Section 4.10.1.4).

4.10.2.3 Soil Erosion

Some short-duration impacts to soil resources as a result of program-induced soil erosion are expected to be high at the site level because of the presence of highly erodible soil at some launch facilities and along some T/E routes. These impacts are not expected to be significant. Long-duration impacts to soil resources would be restricted to the base. At the base, site impacts in the training area are considered high and significant because the impacts extend beyond the functional life of the program and would cause irreparable loss of the topsoil. Regional impacts to topsoil from soil erosion are expected to be negligible.

Wind Erosion. Ground disturbance from road widening, road upgrades, or bridge modifications and replacements is expected to result in adverse impacts along portions of the T/E route system, especially those road segments parallel to the prevailing wind direction. Some launch facility expansion areas and T/E route segments are underlain by soil highly susceptible to wind erosion; however, the amount of time a soil is left unvegetated from erosion is expected to be only 3 months and the soil would be protected from excessive erosion by the application of a straw mulch or equivalent. By applying the straw mulch, the program-induced wind erosion rates would be substantially reduced and no high or moderate impacts are anticipated. Program-induced wind erosion along T/E routes and at launch facilities is expected to result in short-duration, low, and not significant impacts at the site level.

Ground disturbance associated with construction activities onbase is expected to occur in the area immediately east of Malmstrom AFB for the proposed HML vehicle operations training area and northwest of the base for the proposed housing area. Soil would remain barren for a maximum of 1 year during construction activities but would be covered with a straw mulch or equivalent to enhance revegetation where appropriate. Consequently, wind erosion impacts from these actions are expected to be low and not significant, and restricted to the site level. These impacts are expected to be of short duration and would not be changed by either Housing Option H1 or H2. Soils in the HML vehicle operations training area would remain barren throughout the life of the program. Soils in the eastern portion of the base and immediately adjacent areas are all expected to erode at rates exceeding the maximum tolerable soil loss (6.5 tons per acre per year [T/acre/yr]). Program-induced wind erosion at the HML vehicle operations training area is expected to result in long-duration, high, and significant impacts at the site level.

Sheet Erosion. Ground disturbance from road widening, road upgrades, or bridge modifications and replacements is expected to result in short-duration, high, site-level impacts along small portions of the T/E route system. Potential road-widening activities are expected to accelerate sheet erosion, particularly along road segments constructed in soils with high sensitivity to erosion. Potential road-widening efforts are expected to cause high sheet-erosion impacts along 79 miles of T/E routes likely to be widened. Most of the high sheet-erosion T/E route segments (50 mi) are located in Fergus County. Moderate sheet-erosion is expected along 145 miles of T/E routes where potential widening activities could occur. Most of the moderate sheet-erosion T/E route segments occur in Teton (70 mi) and Fergus (26 mi) counties. The amount of time soils would be

left unvegetated was assumed to be only 3 months, and the soil would be partially protected from erosion by a straw mulch. Short-duration impacts from road widening are anticipated to be high but not significant, and restricted to specific sites. Long-duration impacts would be negligible.

Several launch facility expansion areas are underlain by soil highly susceptible to sheet erosion; however, the soil would be unvegetated for a maximum of 3 months and would then be covered by straw mulch or equivalent. Consequently, high sheet erosion is expected at five or more launch facilities in flights A and N, with most other flights having high impacts at one to three launch facilities. These short-duration impacts would be restricted to specific sites and are considered not significant. All launch facilities in flights J, Q, R, or S are expected to have low or negligible sheet-erosion impacts.

Ground disturbance for new housing is expected to occur adjacent to the northwest corner of Malmstrom AFB. Soil in this potential housing area would remain barren for a maximum of 1 year during construction activities, but would be protected from excessive erosion by the application of a straw mulch. Consequently, sheet erosion is expected to be low, not significant, and restricted to the site level. These impacts are expected to be of short duration and would be somewhat reduced if Housing Option H1 is selected, and eliminated if Housing Option H2 is selected. Soils in the HML vehicle operations training area would remain barren throughout the life of the program and are expected to erode at rates exceeding the maximum tolerable soil loss. Program-induced sheet erosion in the HML vehicle operations training area is expected to result in long-duration, high, and site-level impacts. These impacts are expected to be significant.

4.10.3 Impacts of Alternatives

The three alternatives under consideration use different combinations of the number of HMLs, launch facilities, HMLs per launch facility, and type of HML shelters constructed. It was assumed that all T/E route segments and bridges that potentially require improvement would be upgraded for all alternatives. The impacts to geology and soils would be essentially the same for Alternative 1 as for the Proposed Action. Alternatives 2 and 3 would have greater site impacts than the Proposed Action, but the overall LOI and significance would not be substantially different.

Overall impacts on geology and soils resources are expected to be highest for Alternative 3 because a maximum amount of surface disturbance and land acquisition is anticipated from the use of all 200 launch facilities as opposed to 100 in the Proposed Action and Alternative 1 or 125 as in Alternative 2. Site impacts would vary depending on the launch facilities used. Short-duration impacts for aggregate resources are high and significant for all alternatives because of program demands for aggregate. Long-duration impacts to soil resources by soil erosion would be high and significant for the HML vehicle operations training area on Malmstrom AFB because of long-duration degradation of soils within the area as a result of vehicle operations training exercises.

4.10.3.1 Geologic Hazards

Impacts of all three alternatives are the same as the Proposed Action for geologic hazards. Short- and long-duration impacts at the site level would be low and not significant. Site impacts would vary depending upon launch facilities selected and are considered not significant.

Alternative 1. Impacts on geologic hazards would be the same as for the Proposed Action. Overall negligible impacts are expected at 113 launch facilities with low, not significant impacts at 77 launch facilities. Moderate impacts may occur at eight launch facilities with high impacts anticipated at two sites. It is possible to select 100 launch facilities with negligible impacts for this basing alternative.

Alternative 2. Impacts on geologic hazards would be the same as for the Proposed Action. Negligible impacts are expected at 113 launch facilities with low, not significant impacts at 77 launch facilities. Utilization of 125 launch facilities would result in at least low, not significant impacts at 12 launch facilities.

Alternative 3. Impacts on geologic hazards would be the same as for the Proposed Action. Site impacts to geologic hazards would be moderate and not significant for eight launch facilities, high and not significant for two launch facilities, and negligible or low and not significant for the remaining launch facilities. These would be both short- and long-duration impacts. Impacts at these sites would not be mitigable by avoidance because all 200 launch facilities would be used for peacetime deployment.

4.10.3.2 Geologic Resources

Impacts of all three alternatives to aggregate resources are the same as the Proposed Action. Short-duration impacts would be high and significant at the regional level and long-duration impacts would be moderate but not significant. The program aggregate demand for the Proposed Action is not measurably different from the alternatives. Impacts on energy resources are the same as the Proposed Action. Short-duration impacts would be negligible with long-duration, negligible to low impacts at the site level. Site impacts on energy resources would vary depending upon the launch facilities selected and are not considered significant.

Alternative 1. This alternative requires about 40,000 fewer tons of aggregate than the Proposed Action. This is less than a 2-percent reduction in program demand and would not materially change aggregate supply and production relationships identified for the Proposed Action. Impacts on aggregate resources are expected to be the same as the Proposed Action.

Impacts on oil and gas resources, as well as coal resources, are expected to be the same as the Proposed Action. Negligible impacts are expected for 138 launch facilities and long-duration, low, and not significant impacts are anticipated for 62 sites. Consequently, the maximum impact anticipated for oil and gas resources at the 100 sites selected would be low and not significant impacts at 62 launch facilities with negligible impacts at 38 sites. Sufficient numbers of launch facilities exist in the deployment area to restrict impacts to a negligible LOI.

Alternative 2. Impacts on aggregate resources would be nearly the same as for the Proposed Action. Program demand for this alternative is about 63,000 tons (2%) greater than the Proposed Action. Program demand would not materially change aggregate supply and production relationships identified for the Proposed Action. Impacts on aggregate resources are expected to be the same as the Proposed Action.

Overall impacts on oil and gas resources are expected to be negligible. As many as 138 launch facilities with negligible impacts could be selected for deployment. The remaining facilities would have low and not significant impacts to oil and gas resources. Impacts on coal resources in the deployment area and energy resources at the base would be the same as the Proposed Action.

Alternative 3. This alternative requires about 23,000 fewer tons of aggregate than the Proposed Action. This is about a 1-percent reduction in program demand and would not materially change aggregate supply and production relationships identified for the Proposed Action. Impacts on aggregate resources are expected to be the same as the Proposed Action.

Long-duration, site impacts to energy resources (oil and gas) would be low and not significant for 62 launch facilities. Impacts at the other launch facilities would be negligible. Impacts to coal resources would be the same as the Proposed Action. All short-duration impacts would be negligible.

4.10.3.3 Soil Erosion

Soil-erosion impacts for all alternatives are primarily the same as for the Proposed Action. Short-duration impacts would be low and not significant. Long-duration impacts would be negligible. Site impacts would vary depending upon launch facilities selected and are considered not significant except that long-duration, high, and significant impacts to soil erosion would occur at the HML vehicle operations training area.

Alternative 1. Impacts on soil resources would be the same as the Proposed Action. Program-related LOIs could be restricted to the low, not significant levels by using the 76 launch facilities with negligible impacts and 24 sites with low impacts. Maximum program impacts would result from using the 33 sites with high impacts, 10 sites with moderate LOIs, and 57 sites with low impacts.

Alternative 2. Short-duration, negligible or low, and not significant impacts are expected at the site level for 157 launch facilities. The use of 125 launch facilities would increase the total amount of erosion caused by the program, but regional impacts are still expected to be negligible. Maximum program impacts would result from using the 33 sites with high impacts, 10 sites with moderate impacts, 81 sites with low impacts, and a single launch facility with negligible impacts. Long-duration impacts would be the same as the Proposed Action.

Alternative 3. The LOIs on soil resources from program-induced erosion are rated the same as the Proposed Action. The total amount of erosion would be larger than the Proposed Action, but the dispersed localities of the ground disturbance, the minimal time the ground would be susceptible to accelerated erosion, and the assumed erosion control practices to be implemented by the construction contractor indicate the LOI would not be substantially greater than the Proposed Action. Short-duration, high impacts are expected at 33 sites, moderate impacts at 10 sites, low impacts at 81 sites, and negligible impacts at 76 sites.

4.10.4 Cumulative Impacts

4.10.4.1 Geologic Hazards

Cumulative impacts would be negligible for geologic hazards within the affected area on or adjacent to Malmstrom AFB.

4.10.4.2 Geologic Resources

Cumulative impacts on geologic resources are not expected to change the LOI and significance ratings for aggregate resources. However, the construction of an estimated 12 miles of railroad spur for the Peacekeeper in Rail Garrison program, 9 miles of road, and other onbase facilities is expected to require about 251,000 tons of aggregate and/or railroad ballast. Most of the construction activity will occur in the immediate vicinity of Malmstrom AFB and aggregate would probably come from producers in the Great Falls supply area. Program aggregate demand would occur from 1990 through 1994 with a peak year demand of about 94,000 tons in 1993. Railroad ballast would most likely come from sources outside the Small ICBM aggregate ROI and would be only a very small portion of the total statewide production of railroad ballast. The additional demand is not expected to exceed the production capacity of the Great Falls area.

Coal consumption by the base would likely increase if the Peacekeeper in Rail Garrison program is stationed at Malmstrom AFB, but this additional demand plus baseline demand is expected to be much less than 1 percent of the regional coal production.

4.10.4.3 Soil Erosion

Cumulative impacts from the potential deployment of the Peacekeeper in Rail Garrison program at the base are not expected to change the LOI for soil resources. Construction associated with the new facilities and the rail spur to the main line would result in some short-duration increases in soil erosion at individual sites. Long-duration effects offbase are not expected to be different from those of the Proposed Action.

4.10.5 Impacts of the No Action Alternative

The present and projected future geologic conditions are essentially the same as the baseline conditions for geologic hazards. Mass movement conditions will continue at a rate similar to that determined for the recent geologic past which is low for the region. Land development and road maintenance and construction will proceed at a similar pace to historical trends. These developments will overall initiate or accelerate mass movement conditions at a low rate. For aggregate resources, normal regional expansion will create a steady, low demand in the region, with peak requirements needed to respond to future large construction programs that may occur in the area. Energy resources are expected to be low but fluctuate reflecting state or national trends since local supply and demand is only a small fraction compared to these regions. Soil erosion will occur within the region at a rate similar to the existing baseline rate in response to land development, agricultural practices, and road construction.

4.10.6 Potential Mitigation Measures

Potential mitigations are measures that could be undertaken to reduce or eliminate program impacts. The Air Force would encourage implementation of such measures through environmental awareness and other programs. Potential mitigation measures for geology and soils include developing soil conservation strategies (e.g., minimize slope angle to reduce precipitation runoff velocities, stockpile topsoil and use to aid revegetation efforts) that would be implemented during the construction of facilities, and upgrading of roads and bridges at the base and within the deployment area. These strategies would be used to minimize the exposure of unprotected soil during the period of time between construction and the recovery of vegetation in the disturbed areas. (U.S. Air Force, Federal Highway Administration, and state highway department).

4.10.7 Irreversible and Irretrievable Resource Commitments

Aggregate is a nonrenewable resource in the region and, therefore, its use for this program would result in an irreversible and irretrievable commitment of about 3 million tons of the resource.

4.10.8 Relationship Between the Local Short-Term Use of Man's Environment and Maintenance and Enhancement of Long-Term Productivity

Short- and long-duration effects may occur to the geology and soils resource. Short-duration aggregate demands would be related to construction of facilities, and upgrading or roads and bridges. This short-duration demand may affect the local availability of aggregate but not materially affect regional supplies during the operations phase. Minimal short- and long-duration effects are expected to geologic hazards and other geologic resources. Short-duration effects to soils by erosion are predicted except for the proposed training area adjacent to Malmstrom AFB.

4.11 Air Quality

Construction and deployment of the Small Intercontinental Ballistic Missile (ICBM) system at Malmstrom Air Force Base (AFB) would have an effect on the local air quality. The analysis of impacts considers carbon monoxide (CO) and fugitive dust as primary pollutants. These parameters are used as indicators of program effects on air quality and regional visibility calculations were also performed for emissions of nitrogen oxides (NO_x), sulfur oxides (SO_x), and total suspended particulates (TSP).

4.11.1 Impact Analysis Methodology

The impact analysis methodology for air quality involved three separate procedures: evaluation of program impacts, determination of levels of impact (LOI), and determination of the significance of impacts. The methodology also included consideration of a number of assumptions and assumed mitigations. Impacts were evaluated at the local and regional levels in Great Falls and the deployment area. An overall collective assessment of impacts was also made.

4.11.1.1 Evaluation of Program Impacts

Air quality impacts can be segregated into long-duration, traffic-related impacts during the operations phase, and short-duration, temporary, construction-related impacts at Malmstrom AFB and in the deployment area. The primary pollutant associated with transportation sources is CO, and therefore, is a problem unique to urban areas. The primary pollutant resulting from construction activities is fugitive dust. Appropriate models, incorporating ambient condition data and program assumptions, were used to estimate future conditions resulting from the program. Appropriate screening methodologies were used to estimate the effects on area visibility.

In addition, for Housing Options H1 and H2, construction would occur in and around the greater metropolitan Great Falls area. At this time, specific locations or areas are not identified for housing. Because of the widely scattered nature of housing construction in Great Falls, the construction impacts were not analyzed.

The Hard Mobile Launcher (HML) vehicle operations training area would be on the east side of Malmstrom AFB. The HML training area would consist of training roads, HML maneuver areas, classrooms, and shelters for the training vehicles. A training activity scenario was developed to calculate fugitive dust emissions from the training activity and for model input.

To determine vehicular CO concentrations on selected roadway segments in Great Falls, the Environmental Protection Agency (EPA) mobile source emissions program model, MOBILE 3, was used in conjunction with the CALINE 3 dispersion model (Federal Highway Administration [FHWA] 1979). MOBILE 3 was used to determine specific vehicular mixes (i.e., percentages of light-duty gas/diesel cars and trucks, medium-duty gas/diesel trucks, and heavy-duty gas/diesel trucks), percent hot or cold start operations, inspection/maintenance criteria, and ambient temperature. MOBILE 3 is an accepted EPA procedure for determining composite vehicular emission source strengths for CO.

The computerized CALINE 3 model was used for the estimation of CO concentrations from line (e.g., roadway) sources. The model incorporates vehicular emission factors from MOBILE 3, vehicular volumes, meteorological parameters (i.e., wind speed and

direction and atmospheric stability class), and roadway configuration (based upon a Cartesian coordinate system) to estimate 1-hour and 8-hour CO concentrations for selected roadway segments. Taking the most conservative approach, worst-case meteorological parameters were used in the analysis. These include the wind direction yielding the highest CO concentration at a receptor, 1 meter per second (m/sec) and 2 m/sec wind speeds for the 1-hour and 8-hour analyses, respectively, and atmospheric stability Class 5 (slightly stable) and Class 4 (neutral) for the 1-hour and 8-hour analyses, respectively.

Short-duration air pollution emissions would consist primarily of fugitive dust from areas cleared for construction and from construction-related motor vehicles, which include heavy-duty construction equipment. Construction activity (land clearing, blasting, ground excavation, cut-and-fill operations, etc.) and vehicle movements are the most significant sources of fugitive dust, defined as particulate matter that becomes airborne because of natural causes and/or human activities.

Fugitive dust emissions vary with time as the source activity varies. One important factor contributing to uncertainty in fugitive dust emissions estimates is the uncertainty in the parameters that scale the emissions rates to a specific site; namely, the silt and moisture content of the material and the extent of the source. In spite of these uncertainties, estimates were made for fugitive emissions resulting from construction. Fugitive dust emissions from construction activity are proportional to the area of land being worked and the level of construction activity. Based on the EPA methodology, emissions factors were developed for construction activities. The construction area includes approximately 60 acres at Malmstrom AFB (for the peak-construction year, 1991), approximately 3 acres at each launch facility, 124 bridge upgrades, and 20 foot potential disturbance corridors along T/E roads that may require upgrading in the deployment area. Because the disturbance from launch facility modifications and road and bridge improvements would occur over a 6-year period in a nine-county region, the total countywide fugitive emissions were calculated.

Fugitive dust concentrations were analyzed in detail for construction activities at Malmstrom AFB. The ambient air quality impacts for fugitive dust were estimated with the EPA Industrial Source Complex (ISC) model (EPA 1971) using the emissions data calculated for various activities. Fugitive dust generated by improving roads and bridges in the deployment area and construction at launch facilities and other combustion-related criteria pollutants were not modeled. Instead, the total fugitive dust and other criteria pollutants generated in each county from various construction activities were compared with the known total county emissions.

Heavy diesel-powered construction equipment, trucks, and other motor vehicles used for construction activities at Malmstrom AFB emit pollutants such as sulfur dioxide (SO_2), particulates, (NO_x), CO, hydrocarbons (HC), and other by-products through combustion of fuel. Total emissions of these pollutants from construction equipment and other motor vehicles depend not only on the level of construction activity, but also on the environmental control and management plan of the sites involved. Emissions resulting from heavy diesel equipment were estimated using EPA Document AP-42 and the numbers and types of construction equipment assumed to be on the site. The heavy truck emissions were estimated using the emission factors provided by the EPA (1981). Emissions of SO_2, CO, and NO_2 have been modeled for the combustion products from the construction activity at Malmstrom AFB.

Congress added the 1977 Amendments to the Clean Air Act to address the problem of deteriorating visibility in the mandatory Prevention of Significant Deterioration (PSD) Class I areas (where visibility is an important value). Mandatory Class I areas include national parks, wilderness areas, and international parks. Impairment to visibility is defined as that which interferes with the management, protection, preservation, or enjoyment of the visitor's visual experience of the mandatory Class I area, which may be traceable to a specific source. It is EPA policy to consider impacts on Class I areas from sources within about 60 miles of the area. The nearest Class I area to Malmstrom AFB is Gates of the Mountains Wilderness, about 48 miles away. Visibility is a function of TSP levels as well as other parameters (NO_2 and SO_2). The EPA visibility workbook was used to determine potential visibility impairment on Gates of the Mountains Wilderness from proposed program activities during the construction phase. Visibility analysis for deployment area construction activities was not addressed on the nearby PSD Class I areas due to the scattered nature of construction activity.

4.11.1.2 Determination of Levels of Impact

The magnitude of program effects on air quality were classified as having negligible, low, moderate, or high LOIs depending on the general health effects of pollutants generated by program facilities and activities. These were determined by known or projected ground-level concentrations and their relationship to applicable ambient air quality standards. In addition, EPA minimum threshold increments from new or modified major sources in nonattainment areas were used to better define the LOI definitions. The analysis includes a breakdown of LOIs by both areal extent and duration, as appropriate. Separate LOI criteria have been developed for CO, fugitive dust, and visibility.

The LOI definitions for carbon monoxide are the following:

- Negligible Impact -- Predicted incremental CO concentrations would not equal or exceed EPA minimum threshold levels (500 micrograms per cubic meter [$\mu g/m^3$] or 0.45 parts per million [ppm] over an 8-hr period or 2,000 $\mu g/m^3$ or 1.8 ppm over a 1-hr period). These increments plus background concentrations would be minimal when compared to the national or state air quality standards. No general health effects would occur.

- Low Impact -- Predicted incremental CO concentrations would equal or exceed EPA minimum threshold levels, but the concentrations plus background would not exceed 5000 $\mu g/m^3$ or 4.5 ppm over an 8-hour period or 20,000 $\mu g/m^3$ or 17.5 ppm over a 1-hour period, which is 50 percent of the National Ambient Air Quality Standards (NAAQS). No general health effects would occur but pollutant concentrations would show some increase.

- Moderate Impact -- Predicted incremental CO concentrations plus background would equal or exceed the 50 percent level of the NAAQS, but the total concentrations would not exceed the NAAQS (10,000 $\mu g/m^3$ or 9 ppm over an 8-hr period or 40,000 $\mu g/m^3$ or 35 ppm over a 1-hr period). No general health effects would occur but pollutant concentrations would rise measurably.

- High Impact -- Predicted incremental CO concentrations would exceed the NAAQS (10,000 $\mu g/m^3$ or 9 ppm over an 8-hr period or 40,000 $\mu g/m^3$ or

35 ppm over a 1-hr period) when combined with background concentrations. General health effects would include decreased exercise capacity in angina patients.

The LOI definitions for fugitive dust are the following:

- Negligible Impact -- Predicted incremental concentrations of fugitive dust would not equal or exceed EPA minimum TSP threshold levels (1 $\mu g/m^3$ averaged annually or 5 $\mu g/m^3$ over a 24-hr period). These concentrations plus background would be minimal compared to the standards. No general health effects would occur.

- Low Impact -- Predicted incremental concentrations of fugitive dust would exceed minimum EPA TSP threshold levels, but the increment plus background concentrations of TSP would not exceed secondary TSP ambient air quality standards of 60 $\mu g/m^3$ averaged annually or 150 $\mu g/m^3$ over a 24-hour period. No general health effects would occur, but pollutant concentrations would show some increase.

- Moderate Impact -- Predicted incremental concentrations of fugitive dust would exceed minimum EPA TSP threshold levels and the increment plus background concentrations of TSP would exceed secondary TSP ambient air quality standards of 60 $\mu g/m^3$ averaged annually or 150 $\mu g/m^3$ over a 24-hour period. The TSP primary NAAQS of 75 $\mu g/m^3$ averaged annually or 260 $\mu g/m^3$ over a 24-hour period would not be exceeded. No general health effects would occur but pollutant concentrations would rise measurably.

- High Impact -- Predicted incremental concentrations of fugitive dust would exceed the TSP primary NAAQS (75 $\mu g/m^3$ averaged annually or 260 $\mu g/m^3$ over a 24-hr period) when combined with background concentrations of TSP. General health effects would begin with mild aggravation to the upper respiratory systems of susceptible people.

The air quality effects on visibility were determined for Class I (regional-scale) areas. The level of visibility impairment as applicable to the program area was classified as described in the following. These classifications were based on existing visual ranges near Class I areas. The EPA has not promulgated standard visual ranges as criteria for accepted clear zone distances within Class I areas; however, visual range is generally reported with respect to a distinct set of visibility markers (e.g. mountains, buildings, or towers) as used and recorded at various airport weather stations. This historic information was used to develop LOI for visibility at the Gates of the Mountain Wilderness. The LOI definitions for visibility are the following:

- Negligible Impact -- Predicted levels of visual range would not be less than the existing program area median yearly visual range of 64 miles.

- Low Impact -- Predicted levels of median yearly visual range would be reduced to between 50 to 63 miles.

- Moderate Impact -- Predicted levels of median yearly visual range would be reduced to between 30 to 49 miles.

- High Impact -- Predicted levels of median yearly visual range would be reduced to less than 30 miles.

4.11.1.3 Determination of Significance

The significance of air quality resource impacts were evaluated in accordance with Council on Environmental Quality (CEQ) regulations. Significance was assessed through evaluation of the context and intensity of the impacts. Context includes consideration of the settings (site, local, or regional) and the duration of the impacts. The CEQ regulations provide ten items that should be considered in evaluating intensity. Of these ten items, the following are applicable to the air quality resource:

- Impacts that may be both beneficial and adverse. A significant effect may exist even if the Federal agency believes that on balance the effect will be beneficial.

- The degree to which the proposed action affects public health or safety.

- Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas.

- The degree to which the effects on the quality of the human environment are likely to be highly controversial.

- The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

In addition to these considerations, which are specifically identified in the CEQ regulations, the following additional consideration is judged appropriate for the air quality analysis:

- Whether the program causes an increase in predicted concentrations of an individual pollutant, when combined with background concentration levels, such that the applicable ambient air quality standard is equaled or exceeded; and

- Whether the program is expected to cause reductions in the median yearly visibility range to below 30 miles.

4.11.1.4 Assumptions and Assumed Mitigations

The following assumptions were considered in developing the pollutant emissions as an input to the various models used:

- Construction would disturb about 3 acres of land at each launch facility;

- Road and bridge construction would consist of potential widening of deployment area roads and rebuilding 124 bridges; and

- Fugitive dust would be controlled by regular watering of construction areas. This measure would be included in the construction contract specifications to minimize construction-phase emissions.

No assumed mitigations were included as part of this assessment.

4.11.2 Impacts of the Proposed Action

Short-duration air quality impacts from the Proposed Action are expected to be low and not significant regardless of the housing option selected (Figure 4.11.2-1); however, long-duration impacts would be negligible. Construction at Malmstrom AFB and at the launch facilities would produce two types of air contaminants: (1) fugitive dust generated by soil movement and (2) exhaust emissions from vehicles and construction equipment. The equipment emissions and dust produced during construction activities, including excavation and grading, though of short duration, could be troublesome to some workers and could affect adjacent areas, but would not produce any significant impacts on ambient air quality. In addition, the potential long-duration air quality impacts associated with increases in traffic in Great Falls during the operations phase would likewise not significantly affect ambient air quality.

Fugitive Dust Emission Impacts at Malmstrom Air Force Base. Fugitive dust generated at Malmstrom AFB for the peak-construction year (1991) would have low and not significant impacts on Great Falls air quality (EPA minimum threshold levels for TSP in nonattainment areas would be exceeded, but no violation of NAAQS would occur.) Table 4.11.2-1 shows the estimated maximum emissions at selected receptors as determined by the ISC model. The results indicate that maximum impacts would be confined to within 2 kilometers (km) of the construction areas. A program-related increase of 6.81 μg will occur to the residential area located 1 km west of Malmstrom AFB. This would increase the background concentration to 66.81 $\mu g/m^3$. The predicted TSP emissions and the background would not exceed or equal the 24-hour NAAQS of 260 $\mu g/m^3$. In addition, at this site, the annual background concentration would increase to 25.08 $\mu g/m^3$, which would not equal or exceed the standard of 75 $\mu g/m^3$. Construction and operation of the Small ICBM would result in some degradation of air quality especially during the construction phase. These impacts would be short duration in nature and would not by themselves violate any air quality standards.

The HML vehicle operations training area fugitive dust (TSP) emissions for the 24-hour average would be 41.8 $\mu g/m^3$ and would occur along the eastern base boundary. The predicted TSP emissions and the background would not equal or exceed the 24-hour NAAQS of 260 $\mu g/m^3$.

No degradation of regional visibility due to fugitive emissions was predicted at the nearest PSD Class I area (Gates of the Mountains Wilderness), which is located 48 miles from Malmstrom AFB. The short- and long-duration impacts would be negligible. The SO_2, CO, and NO_2 emissions have been modeled for combustion products from construction activity at Malmstrom AFB. Because of the insignificant values, they were not presented.

Construction-Related Emissions in the Deployment Area. Construction activities in the nine-county deployment area include building 100 HML shelters, potential upgrading of T/E roads and launch facility access roads, and rebuilding 124 bridge structures. Fugitive dust (TSP) emissions from these activities are shown in Table 4.11.2-2.

LEVEL OF IMPACT	SIGNIFICANCE	
Adverse Impacts	Not Significant	Significant
Negligible	□	
Low	○ (small)	● (small)
Moderate	○ (medium)	● (medium)
High	○ (large)	● (large)
Beneficial Effects	▒ (shaded)	

Note: Some resource elements may have both beneficial effects and adverse impacts.

AIR QUALITY

ELEMENT/AFFECTED INTEREST	PROGRAM IMPACTS											
	SHORT DURATION						LONG DURATION					
	PROPOSED ACTION						PROPOSED ACTION					
	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
FUGITIVE DUST												
GREAT FALLS AREA	○	○	○	○	○	○						
DEPLOYMENT AREA												
CARBON MONOXIDE												
GREAT FALLS AREA												
DEPLOYMENT AREA												
VISIBILITY												
GATES OF THE MOUNTAINS WILDERNESSS AREA												

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FIGURE 4.11.2-1 LOCAL AND REGIONAL IMPACTS TO AIR QUALITY ASSOCIATED WITH THE PROPOSED SMALL ICBM PROGRAM IN MONTANA

Table 4.11.2-1

Construction-Related Fugitive Dust Impacts at Selected Receptors in Great Falls, Montana

Location	Distance From Base (meters)	Averaging Period	Estimated Impacts ($\mu g/^3$)	Background[1] Concentration ($\mu g/m^3$)	Estimated Impacts Including Background ($\mu g/m^3$)
Great Falls					
Downtown	4,900	24-hour	2.01	122.0	124.01
		Annual	0.02	43.1	43.12
Loy School	70	24-hour	4.30	60.0	64.30
		Annual	0.14	25.0	25.14
Chief Joseph School	800	24-hour	5.00	60.0	65.00
		Annual	0.11	25.0	25.11
Residential Area A	1,070	24-hour	6.81	60.0	66.81
		Annual	0.08	25.0	25.08

Note: [1]Background concentrations were obtained in consultation with Montana Air Quality Bureau.

Table 4.11.2-2 also shows the peak-year (1991) comparison of construction-related program emissions with regional air quality emissions inventory extracted from the EPA National Emissions Data Systems for CO, HC, NO_x, SO_x, and TSP emissions for each county within the deployment area. These estimates were based on a mix of construction equipment relating to road and bridge construction and launch facility construction. As shown in Table 4.11.2-2, the greatest increase predicted for any parameter for any county is less than 4 percent, with approximately 82 percent of the parameters showing increases of less than 1 percent.

The fugitive dust particulates from construction activities would increase less than 1.5 percent in all counties. The analysis indicates that short-duration impacts from construction within the deployment area would be negligible.

Vehicular Emissions in Great Falls. The results of the CO assessment for 1985 (base year), 1990 (construction phase), and the year 2000 (operations phase for Housing Option H2) are shown in Table 4.11.2-3. During the construction phase (1990), the predicted CO concentrations would result in negligible impacts on Great Falls traffic corridors. The largest increase in CO was predicted to be 0.2 ppm and 0.1 ppm for the 1-hour and 8-hour periods, respectively, as compared to future baseline.

The Proposed Action with Housing Option H2 was modeled for CO during the operations phase (year 2000). This option was selected because it has the greatest predicted increase in traffic along Great Falls traffic corridors. For this alternative, the largest

Table 4.11.2-2

Air Pollutant Emissions Impacts From Deployment Area Peak-Year Construction Activities (1991)

County		Pollutant in Tons/Year					
		CO	HC	NO_x	SO_x	TSP	TSP[1] (fugitive)
Cascade:	Regional	43,981	8,017	5,353	1,838	3,086	28,901
	Project[2]	5.17	1.28	12.93	1.11	0.86	101.76
	% Increase	0.01	0.02	0.24	0.06	0.03	0.35
Chouteau:	Regional	7,700	1,289	673	74.0	202	29,272
	Project	2.04	0.44	5.10	0.44	0.34	31.32
	% Increase	0.03	0.03	0.76	0.59	0.17	0.11
Fergus:	Regional	16,101	2,240	1,298	131	509	20,565
	Project	12.19	3.02	30.49	2.63	2.02	216.47
	% Increase	0.08	0.13	2.35	2.01	0.40	1.05
Judith Basin:	Regional	4,429	653	393	39.0	91.0	10,297
	Project	1.85	0.46	4.63	0.40	0.16	41.96
	% Increase	0.04	0.07	1.18	1.03	0.18	0.41
Lewis & Clark:	Regional	124,750	12,340	4,552	26,638	2,286	23,526
	Project	2.57	0.64	6.42	0.55	0.43	45.03
	% Increase	-0-	0.01	0.14	-0-	0.02	0.19
Pondera:	Regional	4,653	1,177	579	61.0	385	9,957
	Project	2.19	0.54	5.48	0.47	0.36	45.82
	% Increase	0.05	0.05	0.81	0.77	0.09	0.46
Teton:	Regional	4,969	775	660	63.0	183	13,103
	Project	9.78	2.42	24.45	2.11	1.62	156.32
	% Increase	0.20	0.31	3.70	3.35	0.89	1.19
Toole:	Regional	3,359	685	510	43.8	217	12,215
	Project	0.45	0.11	1.13	0.10	0.08	8.44
	% Increase	0.01	0.02	0.22	0.02	0.04	0.07
Wheatland:	Regional	3,459	515	209	17.0	57.0	5,399
	Project	1.55	0.38	3.87	0.33	0.26	29.44
	% Increase	0.04	0.07	1.85	1.94	0.46	0.55

Note: [1]TSP (fugitive dust) emissions from the project represented for the total construction activity period (6 years).

[2]Does not include construction activities at Malmstrom AFB.

Table 4.11.2-3

Predicted Carbon Monoxide Concentrations at Selected Receptors for 1985, 1990, and 2000 (ppm)

		1985	Projection for 1990			Projections for 2000		
Roadway Segment	Averaging Time	Baseline	Future Baseline	Proposed Action	Difference	Future Baseline	Proposed Action With Housing Option H2	Difference
Great Falls, Montana								
10th Avenue South								
Between 57th Street and	1-hour	2.4	2.2	2.3	0.1	2.1	2.5	0.4
South Gate of Malmstrom AFB	8-hour	0.7	0.7	0.7	0.0	0.6	0.7	0.1
10th Avenue North								
Between 57th Street and	1-hour	2.8	2.7	2.9	0.2	2.5	2.8	0.3
Commercial Gate	8-hour	0.8	0.8	0.8	0.0	0.7	0.8	0.1
2nd Avenue North								
Between 38th and 57th Streets	1-hour	4.7	4.4	4.6	0.2	3.9	4.4	0.5
	8-hour	1.3	1.2	1.2	0.0	1.1	1.1	0.0
Between 57th Street and	1-hour	6.9	6.3	6.5	0.2	5.4	6.0	0.6
Malmstrom AFB Main Gate	8-hour	1.7	1.6	1.6	0.0	1.4	1.5	0.1

increase in CO was predicted to be 0.6 ppm and 0.1 ppm for 1-hour and 8-hour periods, respectively, occurring in the year 2000. These levels would result in negligible impacts. Since the traffic projected for the Proposed Action with any other housing option is lower than in Housing Option H2, impacts were also judged negligible.

4.11.3 Impacts of Alternatives

Impacts were assessed for CO from vehicular traffic and construction-related air quality impacts onbase and in the deployment area. Overall short- and long-duration impacts to air quality are rated negligible for all alternatives.

There would be very little difference to air quality among the alternatives during onbase construction of the various facilities. The only differences would result from the amount of land disturbed onbase by new housing. Compared to the Proposed Action, Alternative 1 would disturb 28 acres less during the peak-construction year, and Alternative 2 would disturb 13 acres more. Alternative 3 impacts for new housing would be the same as the Proposed Action because the same number of acres would be disturbed. The short-duration impacts of the fugitive dust generated by these disturbances are expected to be negligible.

During construction activities at the launch facilities, Alternatives 1, 2, and 3 would generate fugitive dust emissions by disturbing a total of 300, 375, and 400 acres, respectively in nine counties. The fugitive dust emissions generated are not substantially different from those of the Proposed Action. These emissions are distributed among nine counties. Fugitive dust impacts during construction would be negligible and would not substantially contribute to the future baseline county emissions.

Alternatives 1, 2, and 3 include provisions for onbase military family housing. However, during the operations phase, there would be some small amount of program-related peak-hour commuting traffic. The long-duration CO impacts generated by this traffic would be negligible and would not contribute to the 1-hour and 8-hour NAAQS.

4.11.4 Cumulative Impacts

The overall short- and long-duration impacts from the combined Peacekeeper in Rail Garrison and Small ICBM programs are predicted to be negligible.

Concurrent deployment of the potential Peacekeeper in Rail Garrison and Small ICBM programs at Malmstrom AFB would result in additional onbase construction activities, creating additional air pollutant emissions. Peacekeeper in Rail Garrison construction would involve about 5 acres of technical and Rail Garrison facilities within a 125-acre technical support area and about 11 acres for personel support facilities, including housing. This construction would generate about 70 tons of fugitive dust over a 3-year construction phase.

The fugitive dust emissions for the Peacekeeper in Rail Garrison program at Malmstrom AFB would be low and not significant and would not cause the violation of ambient air quality standards. Other combustion-related emissions generated from the Peacekeeper in Rail Garrison program would be minimal and not significant.

No cumulative impacts at launch facilities would occur.

4.11.5 Impacts of the No Action Alternative

Under the No Action Alternative, the Air Force will continue to maintain existing Minuteman ICBMs. The scope of such activities will not affect the rural deployment area or the urban center around Great Falls.

The long-duration, projected future vehicular traffic CO concentrations, including existing programs, the KC-135R air refueling mission, and normal population growth in the City of Great Falls for the years 1990 and 2000, are shown in Table 4.11.2-3. The results indicate CO concentrations for worst-case climatic conditions for 1-hour and 8-hour averaging are lower than the baseline (1985) conditions. This is due to newer model cars, which have pollution control equipment that generate lower CO emissions, replacing older cars with higher CO emissions, and only minimal increases in traffic volumes. No state or federal ambient air quality standards will be equaled or exceeded.

Continued construction at the base will generate fugitive dust and combustion-related pollutants, which will be minimal and will not cause any violations of air quality standards.

No other programs are presently planned that will cause any air quality violations at the launch facilities. Roads and bridges throughout the State of Montana will be repaired through regular maintenance as needed, and should not be a problem for the excellent air quality in the region.

4.11.6 Potential Mitigation Measures

No mitigation measures are recommended for air quality.

4.11.7 Irreversible and Irretrievable Resource Commitments

Implementation of the proposed program would result in no irreversible or irretrievable resource commitments with respect to air quality.

4.11.8 Relationship Between the Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

The proposed program and alternatives would not deteriorate existing air quality in the operations phase, but would cause short-duration, temporary, local impacts during the construction phase.

4.12 Noise

Construction and deployment of the Small Intercontinental Ballistic Missile (ICBM) system at Malmstrom Air Force Base (AFB) would generate additional noise in the local environment. The analysis of impacts considers noise levels generated by construction vehicles and equipment and operations-related vehicles.

4.12.1 Impact Analysis Methodology

Background noise monitoring was conducted at ten sites in and around Malmstrom AFB to obtain a representative measure of the existing sound levels. The impact analysis methodology for noise involved three separate procedures: evaluation of program impacts, determination of levels of impact (LOI), and determination of the significance of impacts. The methodology also included consideration of a number of assumptions and assumed mitigations. Impacts were evaluated at the local level comparing the program noise with the background noise levels. Local-level noise impacts were evaluated for construction activities at Malmstrom AFB and at the launch facilities and the traffic noise levels in the Great Falls area.

4.12.1.1 Evaluation of Program Impacts

The noise impacts of the Proposed Action would be caused by construction activities and additional traffic generated by operation of the Small ICBM. Studies have provided estimates of the existing and program-related traffic volumes on several traffic corridors within the City of Great Falls. At most locations, estimates of program-related traffic were well below 10 percent of the existing average daily traffic (ADT) volume in Great Falls traffic corridors. Traffic corridors where ADT volume would increase by 10 percent or close to 10 percent as a result of the program were analyzed for noise impacts. For the construction noise evaluation, a general approach was used from the Environmental Protection Agency (EPA) published noise guidelines for construction equipment and for typical construction sites.

The Federal Highway Administration (FHWA) STAMINA 2.0 computerized noise model was used to predict noise levels resulting from motor vehicle operation (FHWA 1982) for the years 1985, 1990, and 2000. This model predicts noise levels from light-duty vehicles (autos and light trucks), medium-duty vehicles (2-axle, 6-tire trucks), and heavy-duty vehicles (trucks with more than 2 axles). STAMINA 2.0 incorporates data on vehicle volumes, vehicle speeds, and the physical characteristics of the roadway and surrounding environment into the calculation of noise-level values. The predicted peak-hour volumes used in the analysis were provided by the transportation analysis (Section 4.3). Additionally, calculations for roadway grade, reflective and absorptive barriers, ground cover, and adjustments for noise levels as they may vary over distances are also components of this model.

The FHWA has established a noise abatement level for highway projects of 65 decibels weighted on the A-scale (dBA) for the activity category that includes parks, residences, and schools. The 65-L_{eq} (1-hour energy equivalent sound level expressed in dBA) noise value was used to determine the location of existing high noise levels relative to traffic and compared with program-induced traffic noise levels.

Principle construction activities would occur at Malmstrom AFB and at the launch facilities. Noise impacts associated with construction of the proposed program were evaluated within the immediate vicinity of these program areas and compared with the EPA recommended standard of 55-L_{dn} (day/night equivalent noise level expressed in

dBA). The specific noise-level changes would depend on the types and number of equipment used, the construction methods, and the scheduling of work. Based upon typical noise levels from construction equipment (Table 4.12.1-1) and typical ranges of expected noise levels at construction sites, noise levels from Small ICBM construction activity were estimated.

4.12.1.2 Determination of Levels of Impact

Noise effects due to program-related increases in vehicular or construction activities (individually or in combination) were classified as having a negligible, low, moderate, or high impact depending upon the magnitude and/or duration of that effect upon the existing ambient noise environment, relative to the local population and/or land use. Noise impacts are confined to the local vicinity of the noise sources. Noise sources and noise sensitive receptors are very site specific; any residential and public areas that may be affected by noise from program construction or operations were included in the study area for this program.

The following LOIs were used in the analysis:

- Negligible Impact -- Predicted noise impacts would not exceed ambient noise levels by more than 2.9 dBA. The increase is perceived as not noticeable.

Table 4.12.1-1

Typical Noise Levels of Principal Construction Equipment

Noise Level in dBA at 50 Feet (L_{eq} 1-hr)			
Structure Construction		Excavation and Earth Moving	
Crane	75-87	Bulldozer	80
Welding generator	71-82	Backhoe	72-93
Concrete mixer	74-88	Front Loader	72-84
Concrete pump	81-84	Dump truck	83-94
Concrete vibrator	76	Jackhammer	81-98
Air compressor	74-87	Scraper	80-93
Pneumatic tools	81-98	Clearing	
Bulldozer	80	Bulldozer	80
Cement and dumptrucks	83-94	Front loader	72-84
Front loader	72-84	Dump truck	83-94
Dump truck	83-84	Jackhammer	81-98
Paver	86-88	Crane with headache ball	75-87
Grading and Compacting		Landscaping and Cleanup	
Grader	80-93	Bulldozer	80
Roller	73-75	Backhoe	72-93
		Truck	83-94
Paving		Front loader	72-84
Paver	86-88	Dump truck	83-94
Truck	83-94	Paver	86-88
Tamper	74-77		

Source: U.S. EPA 1971a.

- Low Impact -- Predicted noise impacts would exceed ambient noise levels by 3 to 4.9 dBA. The increase is perceived as barely noticeable.
- Moderate Impact -- Predicted noise impacts would exceed ambient noise levels by 5 to 9.9 dBA. The increase is perceived as clearly noticeable.
- High Impact -- Predicted noise impacts would exceed ambient noise levels by 10 dBA or more. The increase is perceived as doubling of the noise level.

An increase in dBA levels related to program activities would produce the same LOI when added to either the FHWA 65 dBA (L_{eq}) standard used for transportation impacts or the EPA-recommended 55 dBA (L_{dn}) used for construction impacts.

4.12.1.3 Determination of Significance

The significance of noise impacts were evaluated in accordance with Council on Environmental Quality (CEQ) regulations. Significance was assessed through evaluation of the context and intensity of the impacts. Context includes consideration of the settings (site, local, or regional) and the duration of the impacts. The CEQ regulations provide ten items that should be considered in evaluating intensity. Of these ten items, the following are applicable to the noise resource:

- The degree to which the proposed action affects public health or safety;
- Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas;
- The degree to which the effects on the quality of the human environment are likely to be highly controversial; and
- The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.

In addition to the considerations specifically identified in the CEQ regulations, an increase in noise will be considered significant if the following condition occurs for an extended period of time:

- An increase in noise levels related to construction activities of greater than 10 dBA, if the existing noise levels are below the EPA-recommended 55 dBA (L_{dn}) (creates a potential nuisance) which is comparable to 57-dBA L_{eq} (1-hour energy equivalent); and
- If the noise levels related to traffic exceed the FHWA standard of 65 dBA (L_{eq}) at any time.

4.12.1.4 Assumptions and Assumed Mitigations

The vehicular noise assessment assumed that roadways operated at a minimum of 30 miles per hour (mph) during the peak-hour period. This speed limit is the lowest threshold for which STAMINA 2.0 can predict associated noise levels. It represents a conservative estimate for worst-case noise analysis since lower assumed speeds would result in correspondingly lower noise level predictions.

It was assumed that standard construction procedures would be used, including adherence to local noise ordinances which may have restrictions on truck size, truck routes, and the time of operation near residential areas. Construction equipment was assumed to operate with baffles and mufflers.

No assumed mitigations were included as part of this assessment.

4.12.2 Impacts of the Proposed Action

Long-duration noise impacts resulting from vehicular traffic during the operations phase of the proposed program would be negligible. Short-duration noise impacts are rated moderate and not significant as a result of construction noise generated at launch facilities (Figure 4.12.2-1).

Vehicular Noise. The results of the STAMINA 2.0 noise analysis for 1985 (base year), 1990 (peak-construction workforce year), and the year 2000 (first year of full operations for Housing Option H2) are shown in Table 4.12.2-1. During the construction phase (1990), the changes in vehicular noise levels would result in a negligible impact on local receptors. The maximum predicted increase in noise levels for 1990 was along 10th Avenue North (between 57th Street and the commercial gate) with a noise-level increase of 1.1 dBA (as compared to future baseline) during the 1-hour peak of vehicular traffic along this route. This noise level increase was measured at 5 feet from the road right-of-way. The residential area is approximately 400 feet from the roadway; therefore, the predicted increase of 1.1 dBA would not be discernible.

The Proposed Action with Housing Option H2 was modeled with STAMINA 2.0 for the operations phase (year 2000). This option was selected because it has the greatest predicted increase in traffic volumes along Great Falls traffic corridors. The maximum predicted increase in noise levels for the year 2000 was along U.S. 87/89 (between 57th Street and the south gate of Malmstrom AFB) with a noise-level increase of 1.9 dBA, which is barely noticeable as compared to future baseline. Furthermore, there are no sensitive receptors at this location. Therefore, the long-duration, program-related vehicular noise impacts in Great Falls are rated negligible for this Housing Option H2. Since the traffic projection for the Proposed Action with any housing option is lower than for Housing Option H2, impacts are judged to be negligible.

Noise impacts resulting from the Hard Mobile Launcher (HML) vehicle operations training area would be negligible. Tests conducted during the operation of the HML at Yuma Proving Ground, Arizona, showed noise levels of 80 dBA from 100 feet decreasing to 52 dBA at a distance of 2,640 feet. The HML vehicle operations training area would be located near the east side of Malmstrom AFB and there are no sensitive receptors in the vicinity which would be affected by the HML training activity. Therefore, the long-duration impacts of HML training are expected to be negligible.

Construction Noise. Temporary impacts resulting from noise associated with construction of the proposed program would occur within the immediate vicinity of construction sites. However, the precise noise levels would depend on the specific types of equipment used, the construction methods, and the scheduling of work. Several general conclusions can be made based on the types of construction work anticipated and the similarities of equipment and their associated range of noise levels. Based upon noise data contained in Table 4.12.2-1, construction noise associated with assumed activities can be estimated.

LEVEL OF IMPACT	SIGNIFICANCE: Not Significant	SIGNIFICANCE: Significant
Adverse Impacts		
Negligible	□	
Low	○ (small)	● (small)
Moderate	○	●
High	○ (large)	● (large)
Beneficial Effects	▒ (shaded)	

Note: Some resource elements may have both beneficial effects and adverse impacts.

NOISE

ELEMENT/AFFECTED INTEREST	PROGRAM IMPACTS (LOCAL): SHORT DURATION: PROPOSED ACTION: PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3	LONG DURATION: PROPOSED ACTION: PROGRAMMED HOUSING	WITH HOUSING OPTION H1	WITH HOUSING OPTION H2	ALTERNATIVE 1	ALTERNATIVE 2	ALTERNATIVE 3
NOISE	○	○	○	○	○	○						
GREAT FALLS												
MALMSTROM AFB												
DEPLOYMENT AREA	○	○	○	○	○	○						

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FIGURE 4.12.2-1 LOCAL IMPACTS TO NOISE ASSOCIATED WITH THE PROPOSED SMALL ICBM PROGRAM IN MONTANA

Table 4.12.2-1

Predicted Noise Levels at Selected Receptors
1985, 1990, and 2000

Roadway Segments	Year	Program Option	Right-of-Way (L_{eq})	Difference	Distance from Right-of-Way Line 100 ft (L_{eq})	200 ft (L_{eq})
Great Falls, Montana						
10th Avenue South						
Between 57th Street and South Gate of Malmstrom AFB	1985	Baseline	64.7		57.6	54.8
	1990	Future Baseline	65.0		57.9	55.1
	1990	Proposed Action (construction)	65.6	0.6	58.5	55.6
	2000	Future Baseline	65.3	1.9	58.2	55.4
	2000	Proposed Action (operations)	67.2		60.1	57.3
57th Street						
Between 2nd Avenue North and 10th Avenue North	1985	Baseline	64.9		58.4	56.0
	1990	Future Baseline	65.2		58.7	56.4
	1990	Proposed Action (construction)	65.4	0.2	59.0	56.6
	2000	Future Baseline	65.3		58.9	56.5
	2000	Proposed Action (operations)	65.8	0.5	59.4	57.0
10th Avenue North						
Between 57th Street and and Commercial Gate	1985	Baseline	62.8		56.2	53.6
	1990	Future Baseline	62.8		56.2	53.6
	1990	Proposed Action (construction)	63.9	1.1	57.3	54.6
	2000	Future Baseline	63.2		56.6	54.0
	2000	Proposed Action (operations)	64.1	0.9	57.5	54.9
2nd Avenue North						
Between 38th and 57th Streets	1985	Baseline	63.8		58.8	56.5
	1990	Future Baseline	64.3		59.3	56.9
	1990	Proposed Action (construction)	64.7	0.4	59.6	57.3
	2000	Future Baseline	64.5		59.4	57.2
	2000	Proposed Action (operations)	65.2	0.7	60.2	57.8

The various activities that would take place include the following:

- Construction of industrial structures, and housing, roadways (grading, compacting, and paving), landscaping, and cleanup at Malmstrom AFB;

- Grading and compaction, excavation, earthmoving, and minimal structural construction at launch facilities; and

- Widening and improving (grading and compaction) of deployment area roadways, and bridge and culvert reconstruction.

Construction noise at Malmstrom AFB is not anticipated to affect offbase residential land uses since such noise levels from point sources attenuate quickly with distance. Potential construction-related noise levels of 85 to 90 dBA at 50 feet from the source would be reduced to less than 60 dBA 2,000 feet from the source. The nearest offbase residential dwellings are greater than 6,000 feet from various construction sites at Malmstrom AFB, resulting in a negligible impact.

Construction Noise in the Deployment Area. Temporary impacts resulting from noise associated with construction at launch facilities would occur within the immediate vicinity of the construction sites. Grading and other construction activity at the launch facility sites, assuming bulldozer and dump truck activity only, would result in noise levels of approximately 85 dBA at 50 feet. These noise levels would decrease 6 dBA at double the distance from the source and would be reduced to approximately 55 dBA at 1,600 feet. Construction noise may be noticeable during periods when the normal sound levels would be low. There are no applicable state or local community noise regulations for construction activity in the deployment area.

The existing noise levels in the rural areas where launch facilities are located are expected to be 45 dBA. However, the ambient noise levels are estimated to be 50 dBA near a number of launch facilities since they are located near noise sources such as traffic along major highways or local traffic along secondary roads and farm roads. Other noise sources which may raise background noise levels include infrequent agricultural operations throughout the year (agricultural tractor noise level ranges from 92-106 dBA).

There are 45 launch facilities with residences in proximity (within 2,000 ft) to the launch facilities (Section 3.4.3, Table 3.4.3-7). The sound levels from construction activities at the nearest residences to the launch facilities are estimated to be 57 dBA and 55 dBA at 1,200 and 1,600 feet, respectively. An increase in noise levels of 5 to 7 dBA over the background noise level of 50 dBA, caused by construction activities, would have short-duration, moderate, and not significant impacts at the residences located near launch facility sites.

4.12.3 Impacts of Alternatives

Overall noise impacts for all three alternatives are rated the same as those for the Proposed Action. Short-duration impacts would be moderate and not significant and long-duration impacts would be negligible.

Noise impacts at Malmstrom AFB are only expected to vary a small amount between the Proposed Action and the alternatives. The noise impacts from construction and operations activities at Malmstrom AFB would be essentially the same for the Proposed

Action and Alternatives 1 and 3, whereas Alternative 2 would generate a minor increase in noise levels because of increased housing construction. In any case, short-duration construction noise impacts at Malmstrom AFB would be negligible. Likewise, long-duration operations noise impacts would be negligible.

In the deployment area, short-duration, temporary construction noise would be generated at 100 launch facilities for the Proposed Action and Alternative 1, whereas 125 launch facilities would be affected if Alternative 2 is chosen, and 200 launch facilities would be affected if Alternative 3 is chosen. Short-duration, moderate, not significant noise impacts would occur near those launch facilities that are close to existing residential structures.

4.12.4 Cumulative Impacts

Concurrent deployment of the Peacekeeper in Rail Garrison and the Small ICBM at Malmstrom AFB would create a cumulative impact because additional construction activity onbase would create additional noise. However, there would be no change in the noise impacts at launch facilities. Short-duration impacts are rated moderate and not significant and long-duration impacts would be negligible. Cumulative noise effects would consist of additional short-duration noise generated during construction of the Rail Garrison facilities, a spur track connecting to the main line, and additional housing needs. These noise effects would occur primarily on the east side of the base, away from sensitive receptors. Therefore, cumulative, short- and long-duration noise impacts at Malmstrom AFB are rated negligible.

4.12.5 Impacts of the No Action Alternative

If the proposed program is not implemented, a continuation of baseline trends will occur in the area as shown in Table 4.12.2-1. No significant adverse impacts will occur at either Malmstrom AFB or the deployment area.

4.12.6 Potential Mitigation Measures

No mitigation measures are recommended for noise.

4.12.7 Irreversible and Irretrievable Resource Commitments

Implementation of the proposed program would result in no irreversible or irretrievable resource commitments for noise. New air traffic noise contours are currently being prepared for the KC-135R air refueling mission.

4.12.8 Relationship Between the Local Short-Term Use of Man's Environment and the Maintenance and Enhancement of Long-Term Productivity

Implementation of the proposed program would result in short-duration, program-related noise impacts primarily associated with the construction phase at launch facilities. No long-duration noise effects are anticipated; therefore, no effects on the maintenance and enhancement of long-term productivity will occur.

5.0

5.0 SAFETY CONSIDERATIONS

The Small Intercontinental Ballistic Missile (ICBM) system safety program extends from concept development, to system design, through deployment and operations. In the 25-year operating history of the Minuteman ICBM systems, the Air Force has never experienced a mishap leading to a fire or explosion. Further, the technical advances to the components and operating procedures for the Small ICBM system ensure that the proposed system will operate safely.

This chapter begins with a description of the system safety program used in the development, deployment, and operation of the Small ICBM system. Following this, highly unlikely, but theoretically possible mishaps are examined. For purposes of this analysis, conservative risk assumptions were made. The most severe and environmentally threatening mishap scenarios conceivably posed by the deployment of the Small ICBM at Malmstrom Air Force Base (AFB) were used (Section 5.2.2). The probabilities of these events occurring were also calculated. The mishap could result in a solid-propellant, liquid-propellant, or a combined solid/liquid propellant release, and in extreme circumstances, the release of nuclear materials. This could affect one or more of the following environmental factors: air quality, biology, water/soils, and human health and safety.

5.1 System Safety Program

From conceptual development throughout the functional life of Air Force missile systems, safety is an uppermost consideration. All phases of the Small ICBM weapon system acquisition and operation are covered by stringent safety programs. These safety programs include directives and regulations that establish policy, procedures, and criteria based upon a comprehensive set of proven methods derived from both military and civilian experience. Department of Defense (DOD) Instruction 5000.36, System Safety Engineering and Management and Air Force Regulation 800-16, Air Force System Safety Program, establish the requirement for the identification and elimination or control of hazards in the weapon system. The DOD MIL-STD-882B, System Safety Program Requirements, and MIL-STD-1574A, System Safety Program for Space and Missile Systems, provide specific controls that are implemented in the Small ICBM Integrated System Safety Program which is tailored to the specific characteristics of the Small ICBM. These system safety engineering and management controls are applied throughout the functional life of the weapon system from concept development through decommissioning.

The Small ICBM Integrated System Safety Program is a risk management program designed to identify potential mishap risks and define methods to eliminate or minimize these risks. This comprehensive system safety engineering program complies with DOD and Air Force directives. The program encompasses the design, development, fabrication, checkout, modification, test, servicing, maintenance, transportation, handling, training, and deployment of the system, as well as normal and contingency operations during peacetime operation of the system.

System safety engineers have evaluated the system's design to identify and eliminate potential mishaps such as inadvertent ignition of the propellants or the reentry vehicle (RV) by external energy sources or other mechanisms. Proven design criteria, technology, and procedures are being incorporated into the system and its operation to eliminate or minimize the potential hazards. Potential hazards are identified and tracked to ensure that appropriate corrective actions are incorporated into hardware, facilities, procedures, specifications, and drawings.

Lessons learned from the Minuteman I, II, and III and Peacekeeper programs have been incorporated into the design of the Small ICBM weapon system. Where possible, design decisions have been made to enhance the overall safety of the system. For example:

- Insensitive High Explosives (IHE) have been incorporated into the RV. These explosives are stable and insensitive to shock and thermal stimuli.

- A unique software control device prevents unintended missile launch by blocking access to the missile-firing circuits. The missile can only be launched if a unique coded signal is generated and verified.

5.1.1 System Hardware

Prior to test, deployment, and operations, the Small ICBM must receive both explosives safety siting approval for facilities and nuclear safety certification for the weapon system and support equipment. For example:

- Nuclear safety certification is based on nuclear weapon system safety standards and applicable design safety standards in accordance with Air Force 122 series regulations, Nuclear Surety.

- Explosives safety classification and siting approval is obtained from the DOD Explosive Safety Board in accordance with Air Force Regulation 127-100, Explosive Safety Standards.

5.1.1.1 Nuclear Safety

Nuclear safety certification for the Small ICBM ensures that nuclear safety objectives are met through control of critical functions such as authorization, launching, prearming, arming, and target data change. This includes strict control of information that permits these functions to occur. Critical functions are also interlocked with one another so that each function can be accomplished only in a specific order, and only after the preceding function is accomplished in a prescribed manner. This ensures that inadvertent launch or explosion of the RV is virtually impossible.

Air Force Regulation 122-3 outlines policies, responsibilities, and the evaluation process for safety certification of equipment and procedures used with nuclear weapons. The weapon system, support and transportation equipment, test equipment, and procedures must all be certified. These processes are discussed in the following subsections.

Design Certification. Design certification requires the evaluation of the entire weapon system design for compliance with DOD Directive 3150.2, DOD Nuclear Weapon System Safety Standards, using the process defined in Air Force Regulations 122-3 and 122-9. The Nuclear Weapons System Safety Group (NWSSG) is a group shared by the Air Force with representatives from several Air Force major commands, the Department of Energy (DOE), and the Defense Nuclear Agency.

The NWSSG evaluates a nuclear weapon system for compliance with DOD nuclear weapon safety standards. In addition, the Air Force Weapons Laboratory must evaluate and the Air Force Directorate of Nuclear Surety must certify noncombat vehicles (e.g., reentry system transporter and forklift), support equipment, and associated software to ensure compliance with the criteria specified in Air Force Regulation 122-10. Software certification is accomplished (as part of the design certification) in accordance with the

evaluation criteria in Air Force Regulations 122-9 and 122-10. Air Force Regulation 122-9 requires a Nuclear Safety Cross Check Analysis for any software that controls or is required in the prearming, arming, firing, launching, or targeting functions of the nuclear weapon system. This analysis is an independent cross-check that ensures that the software does not initiate any unauthorized functions.

Operational Certification. A comprehensive functional and physical checkout of the individual critical components and the weapon system using procedures approved by the Directorate of Nuclear Surety is required before the nuclear weapon is connected to the rest of the system and before initial operational deployment.

Nuclear Surety Inspection. After a nuclear weapon system has received design certification and has been operationally certified, the operators of the system must successfully pass an initial nuclear surety inspection. Air Force inspectors will review the procedures for receipt of the warhead, assembly of the RV, transportation of the RV, assembly of the missile, checkout of the RV and missile, and placement of the operational system on alert. Facilities and physical security procedures and activities are also reviewed during this inspection.

Decertification and Recertification. A nuclear weapon system or component must be decertified in order to facilitate maintenance. Decertified components may not be returned to use in an operational weapon system until they are recertified. The processes for recertification of a system or component are functionally the same as that for the deployment/operational certification process and follows Directorate of Nuclear Surety approved procedures.

5.1.1.2 Explosives Safety Requirements

Air Force explosives safety requirements are established to prevent or minimize mishaps and associated damage. Implementation of these requirements demands compliance with all directives that control the design, development, testing, production, transportation, handling, storage, and use of explosives. Before accepting an explosive component into the Air Force or federal inventory, it is necessary to establish its hazard classification. Contractors who manufacture Small ICBM explosive components provide the Air Force with explosives hazard classification data that are the basis for the explosives class determinations. These data are used to establish procedures to assure safe handling, packaging, storage, and use of the item.

Although the probability of inadvertent combustion or explosion of missile propellants is low, DOD Standard 6055.9 and Air Force Regulation 127-100 prescribe an explosive safety zone to be maintained for operational and storage locations containing explosives, including missile propellants. Locations containing explosives are required to be at specified minimum distances away from facilities such as other explosive storage areas, inhabited buildings, public traffic routes, recreational areas, and utility systems. These explosive safety zones vary depending on the combination, quantity, and hazard classification of propellants or explosives involved. Based on these factors, preliminary safe distances to other facilities will be determined for the assembled Small ICBM. For example, the explosive safety zone criteria for a fully assembled Small ICBM in earth-covered igloos is 1,250 feet from an inhabited building and 750 feet from a public traffic route.

All three Small ICBM stages will contain a high-performance, solid-propellant rocket motor. Propellant weights are expected to be approximately 24,000 pounds for Stage I,

6,400 pounds for Stage II, and 3,000 pounds for Stage III. The solid propellant in the Small ICBM is expected to have properties similar to that used in the Peacekeeper third stage.

The Post Boost Vehicle (PBV) is powered by approximately 35 to 40 pounds (5 gallons) of liquid propellant (composed primarily of hydrazine) in a stainless steel container. The container is filled and sealed at the factory; it is never opened, repaired, or maintained in the field. The PBV contains the missile guidance control system, shroud and shroud separation motor, and miscellaneous ordnance items all similar in function to those used for the Minuteman system.

The Small ICBM RV is the same as that used on the Peacekeeper. This RV contains an IHE that is very stable. This type of explosive is even safer to handle than the previous Minuteman design, and its use ensures that ignition would occur only upon direct command. The IHE used in the Small ICBM reentry system has been rigorously tested to verify its insensitivity to shock and high temperatures.

5.1.2 Personnel Training and Certification

Safety will be a critical aspect of all Small ICBM maintenance activities. All work on the missile system will be accomplished by highly trained and qualified maintenance technicians.

5.1.2.1 Comprehensive Training Program

A special Training Control Division will schedule, monitor, and control all aspects of training (e.g., job qualification, upgrade training, special technical training programs, recurring training, and management training).

This comprehensive training program will ensure that only highly trained and qualified personnel are permitted to perform work on the weapon system. Teams that handle nuclear weapons will receive special task certifications. All work will be performed in compliance with certified Technical Orders. In addition, a comprehensive quality control program will provide for periodic reviews of maintenance operations, which include evaluation and inspection of personnel, procedures, equipment, facilities, and technical data. The inspection and evaluation teams will perform periodic and unannounced maintenance and technical inspections. A staff of safety professionals and specialists, complemented by senior staff members and field supervisors, will ensure that safety is foremost in all maintenance operations. All applicable Occupational Safety and Health Administration (OSHA) standards and specially developed Air Force Occupational Safety and Health standards will be strictly enforced and Air Force Regulation 40-925, Civilian Personnel Reliability Program.

5.1.2.2 Personnel Reliability Program

All personnel assigned to nuclear weapons activities and operations are evaluated under the criteria specified in Air Force Regulation 35-99, Personnel Reliability Program and Air Force Regulation 40-925, Civilian Personnel Reliability Program. This program is designed to ensure that personnel who perform critical nuclear weapon duties have no medical or psychological traits that might result in behavior that could ultimately threaten the national security of the United States, and to assist in protecting against acts that could lead to attempting unauthorized launch, tampering with the system, or theft of the nuclear weapon. The Personnel Reliability Program is designed to ensure

very high standards of individual reliability for those whose duties are associated with nuclear weapons and nuclear components. Candidates must meet all requirements of the Personnel Reliability Program before they may perform duties associated with nuclear weapons. These requirements include position designation, security clearance, and screening. In addition, personnel are continuously evaluated throughout the entire period of their assignment to nuclear weapons-related work. The program is designed to promptly identify and eliminate unreliable personnel from such positions.

5.1.3 System Safety Group

Safe operation of an ICBM weapon system requires continuing review and evaluation of system modifications, technical manuals, and training programs for technicians that maintain and operate the systems. A System Safety Group (SSG) was formed at the inception of the design phase of the new Small ICBM system to monitor all design and engineering activities. This group ensures that all serious hazards are eliminated or minimized and the system is safe to operate. The SSG will continue to review and monitor the system throughout its functional life. In addition, the NWSSG will conduct a study of the nuclear safety of the weapon system and develop Weapon System Safety Rules for approval by the Secretary of Defense before the system is allowed to become operational. Two years after initial observations begin and then at 5-year intervals, the NWSSG will review all aspects of the system to ensure continued compliance with the DOD nuclear weapons system safety standards. Major modifications affecting nuclear safety are studied by the NWSSG prior to incorporation.

5.2 Emergency Operations

Section 5.1 covered Air Force programs to ensure the safe operation of the Small ICBM during normal activities. This section describes the Air Force's preparations to handle emergency operations and a discussion of some examples.

5.2.1 Air Force Contingency Plans

Although mishaps involving the Small ICBM weapon system that could affect the public are highly unlikely, the Air Force has contingency plans for response.

5.2.1.1 Potential Hazard System

Strategic Air Command Regulation 355-3, "ICBM Potential Hazard System" (PHS) contains procedures for responding to potential hazards involving an ICBM. This regulation is implemented when situations exist that are not covered by Air Force Technical Orders. The ICBM PHS provides a communications network to be used during emergency actions. The PHS is designed to resolve hazardous situations occurring at the local unit level by rapidly establishing centralized control at Strategic Air Command Headquarters. A recovery plan to cover mishap response, decontamination, and cleanup will be developed by appropriate technical experts prior to deploying the system. Experts from Air Force Logistics Command, Air Force Systems Command, other governmental agencies, and aerospace contractors will participate as required. The PHS will be implemented whenever the local unit requests assistance. These procedures exist for Minuteman and Peacekeeper and will be applicable to the proposed Small ICBM when it becomes operational.

5.2.1.2 Disaster Preparedness Program

Air Force Regulation 355-1, U.S. Air Force Disaster Preparedness Program, requires that each installation commander ensure that operations orders, plans, directives, and similar documents contain proper disaster preparedness instructions and guidance. At each ICBM base, Operations Plan 355-1 will be implemented in the event of a mishap involving the missile system. This operations plan includes detailed procedures and checklists to ensure the safety of life and property in the event of a mishap. If a mishap occurs offbase, designated individuals would be dispatched to the scene of the mishap to coordinate with the local civil authorities or to take control of the mishap in accordance with an existing memorandum of understanding with the involved state. If it occurs onbase, the Air Force would take charge of the mishap scene. Planning efforts for coordination with civil authorities include training sessions, joint exercises, and establishment of mutual-aid agreements. The Air Force will publish a plan to cover highway mishaps of the Small ICBM similar to those currently in effect for Minuteman and Peacekeeper missiles.

5.2.1.3 Unauthorized Access

The Air Force has taken positive steps to deny access by terrorists or other unauthorized persons to the Small ICBM. However, because of the sensitive nature of these steps, they will not be described in this document as they are classified for national security reasons. However, should a terrorist attack on a Small ICBM prove successful, the range of environmental impacts would be no worse than those discussed in Section 5.3.2, Environmental and Human Health Effects, which details the effects of a worst-case mishap.

5.2.2 Abnormal Conditions

The Small ICBM weapons system is designed to operate safely and securely under both normal and severe operating conditions. Strict compliance with established operational and maintenance procedures will be maintained. As part of this Environmental Impact Statement (EIS) process, the weapons system design and operations planning communities of the Air Force postulated those conditions which, while highly unlikely, were nonetheless foreseeable and would present the greatest risk of damage to the environment and human health.

5.2.2.1 Potential Mishaps

Given the design of the Small ICBM, the design and structure characteristics of the Hard Mobile Launcher (HML), and system deployment at existing Minuteman facilities, the following cases were developed and analyzed:

Case (1): A HML, while being transported to its basing location at a Minuteman launch facility in Montana, is hit by a fuel tanker truck. The impact speed is in excess of 70 miles per hour (mph), the HML is struck at its most vulnerable point (that offering the least missile protection), total tanker weight is in excess of 80,000 pounds and is fully loaded with 8,000 gallons of gasoline.

Case (2): An airplane collides with a HML while the HML is on alert at a Minuteman launch facility.

Case (3): A plane carrying the warhead is involved in a mishap.

Case (4): A truck transporting the RV is involved in a collision.

5.2.2.2 Mishap Probabilities

Case (1) postulates an 80,000 pound gasoline tanker truck colliding with the side of the HML at 70 to 100 mph. In the initial phase of the mishap, both the truck and the HML tend to crush-up, and after the crush-up both bodies move together, sliding for some distance and come to a complete stop. The gasoline in the tanker truck then ignites and burns close to the HML for a sufficient period of time to ignite the solid fuel stages of the Small ICBM. Rather than an explosion of the missile stages, they continue to burn, more or less in their initial position and configuration, and sufficient heat transfer to the RV occurs to break its protective structure and expose the plutonium of the warhead. Some release of nuclear material into the atmosphere occurs (Section 5.3).

The statistical analysis of the probability (chance) of the subevents necessary to reach this ultimate event has been performed by TRW Defense Systems Group. Probabilities are expressed in numerical form; for example, 0.5 means one chance in two; 4.4×10^{-7} means 4.4 chances in 10 million. The analysis was specific to the Malmstrom AFB deployment area and assumed a 20-year functional lifetime for the Small ICBM system. For subevents (3) through (8) of the probability chain below, there is high confidence that the probability is much less than 0.5 for each subevent. However, because of a lack of empirical data to support this assumption, a probability of 1.0 (a 100-percent chance) is assumed in this conservative analysis. The critical steps of mishap scenario Case (1) and their attendant probabilities are the following:

1. Probability that a motor vehicle collision resulting in a fire would occur: 4.4×10^{-8}

2. Probability that a HML collision resulting in a fire involves a fuel tanker truck (or other vehicle with a large amount of fuel): 0.3

3. Probability that the HML does not drive (or get pushed) clear of the fire: 1.0

4. Probability that the solid propellant of the missile stages ignite: 1.0

5. Probability that the solid propellant does not explode: 1.0

6. Probability that the exhaust plume envelops the RV: 1.0

7. Probability that the exhaust plume temperature is high enough to melt the protective holder of the nuclear material: 1.0

8. Probability that propellant burn time is sufficient to melt the vessel containing nuclear material: 1.0

9. Probability that the conditions are correct to aerosolize 1 percent or more plutonium into a respirable form: 1×10^{-3}

The overall probability of the mishap occurring and resulting in aerosolization of plutonium: less than 1.32×10^{-11} (1.32 chances in one hundred billion).

Case (2) postulates an airplane colliding with a HML while it is on alert at a Minuteman launch facility. Although the HML would be housed in a protective structure, for purposes of this conservative analysis, no credit (decreased probability) was taken for this protection. Further, an aircraft would have to be of sufficient weight (approximately 80,000 pounds) and carry a sufficient amount of fuel to initiate a fire and sustain its burn for a sufficient period of time to ignite the solid propellants of the Small ICBM. Based upon the expected number of aircraft mishaps in Montana, the likelihood that such a mishap would involve a HML location, and a 20-year functional life of the Small ICBM force, the critical steps of mishap scenario Case (2) and their attendant probabilities are the following:

1. Probability that an aircraft collides with a HML: 1.2×10^{-7}

2. Probability that an aircraft of sufficient size collides with a HML: 1.6×10^{-2}

3-9. Events and probabilities are identical to case (1). Overall probability of a mishap resulting in aerosolization of plutonium: less than 1.92×10^{-12} (1.92 chances in one trillion)

Case (3) postulates a mishap involving a transport airplane with a warhead aboard and Case (4) postulates a collision involving a truck carrying a warhead. Neither incident would produce sufficient temperatures to cause aerosolization of plutonium since no missile stages are present to provide sufficient fuel for an extended burn; therefore, the probability of these events occurring was not calculated. In either event, a chance of plutonium dispersal in solid form exists and cleanup would be required.

5.2.2.3 Cleanup Activities

Solid Propellant. The amount of solid propellant cleanup activities at a mishap site is dependent upon the nature of the mishap. The use of fire-retardant chemicals, removal of contaminated soil and debris, and the extent of debris dispersal would determine the impact from the cleanup procedures. In a severe case, significant quantities of soil could be contaminated with solid propellant and its residue, requiring removal after a mishap. The severity of this impact would be dependent upon the environmental conditions at the mishap site. Secondary impacts from cleanup activities are also possible.

Hydrazine. The mechanisms used to detect, cleanup, and dispose of spilled liquid hydrazine would depend upon the volume of hydrazine spilled, the surface on which it is spilled, and the extent and nature of debris from the mishap that may prevent safe access to the hydrazine spill. Pooled hydrazine could contaminate up to 10 square meters of soil. Methods for decreasing the hazards resulting from a pool of hydrazine range from careful collection of the liquid to dilution and chemical neutralization. Hypochlorite compounds (e.g., household bleach) are commonly utilized to neutralize hydrazine. Special care in the application of neutralizing agents would be necessary if cleanup was being carried out in the vicinity of a stream. Proven methods are already used in other Air Force systems and will be included in contingency plans for the Small ICBM.

Nuclear Material. In the event of the dispersal of nuclear materials, cleanup would consist of sealing off the area and physically removing the nuclear material and any contaminated soil. Any contaminated vegetation would require removal and disposal. The specifics of an individual action would depend upon the circumstances of the release

and the character of the local area. Surface contamination could require the removal of up to 5,000 cubic meters of soil in the vicinity of the mishap.

5.3 Case Study

The following section addresses a representative setting within the proposed Montana deployment area and discusses the consequences to the environment of mishap scenarios such as Case (1) or Case (2) outlined in Section 5.2.2.1.

5.3.1 Wind Dispersion Models

Two wind dispersion models were used to simulate the movement of burned or aerosolized materials downwind from the mishap. The first, described below, was used for the burn-off of propellants. The second, described below, was used for the aerosolization of nuclear materials contained within the RV.

5.3.1.1 Propellant Dispersion Model

These mishap scenarios could result in either the evaporation or combustion of the propellants at the scene. Computer modeling techniques were chosen to simulate the downwind movement of the combustion products. Although no model can reproduce the identical topography and cultural features of an existing site, simulation models similar to that used in this analysis are routinely used to predict fuel-spill impacts and to organize emergency responses.

An evaporation/air dispersion model for chemical spills on land, originally developed by Shell Oil Company, SPILLS, was used to simulate the mishap scenario. SPILLS is a model which simulates the evaporation of a chemical spill and the atmospheric dispersion of the vapors. The model estimates concentrations of the vapors based upon the time and distance downwind from pools of liquids and downwind distribution of particulates following combustion.

The downwind movement of toxic particles and vapors is dependent to a large degree on the following parameters: ambient temperature, temperature of the plume, the amount of material to be burned, the burn rate and burn time, meteorological conditions at the site, and local topography. The values of the conditions were chosen to represent those with the highest probability of occurring in the Small ICBM deployment area, not the absolute worst case.

A list of assumptions and conditions used for this model is given in Table 5.3.1-1. Values for other parameters necessary for model runs, such as plume rise, were computed, taken from the literature, or estimated from preliminary model runs.

5.3.1.2 Nuclear Dispersion Model

These mishap scenarios could result in the aerosolization of up to 1 percent of the available plutonium. It should be specifically noted that the analysis in the following sections assumes up to 1 percent aerosolization of the total quantity of nuclear materials in the warhead. The 1-percent figure is derived from tests by Lawrence Livermore National Laboratory where plutonium was exposed to a hydrocarbon fire. This is the worst-case scenario.

Table 5.3.1-1

Model Parameter Assumptions

Ground-level winds	2.0 meters per second (4.5 mph)
500-meter winds	3.0 meters per second (6.7 mph)
Mixing layer depth	500 meters (1,640 ft)
Atmospheric stability	E (moderate instability)
Wind direction (ground level)	From 220 degrees (South-Southwest)
Wind direction at 500 meters	From 230 degrees (West-Southwest)
Ambient temperature	20°C (68°F)
Spill area	
-Hydrazine	$10m^2$ (107.6 sq ft)
-Solid	$100m^2$ (1,076 sq ft)
Solid propellant burn time	20 minutes
Plume rise	150 meters (500 ft)

Computer modeling techniques (including the assumptions listed in Table 5.3.1-1) similar to those used for the propellants were also used for the nuclear dispersion model. The assessment was done by the Lawrence Livermore National Laboratory (Atmospheric and Geophysical Sciences Division). MATHEW, a three-dimensional wind model, and ADPIC, a particle dispersion model were used to simulate the release scenarios.

5.3.2 Environmental and Human Health Effects

This section describes the environmental and human health effects of mishap scenario Case (1) a collision of the HML and a large fuel tanker truck. This discussion treats solid-propellant releases first, liquid-propellant releases second, a combined liquid and solid propellants release third, and last, a release of nuclear materials combined with a propellant burn.

5.3.2.1 Incidents Involving Solid Propellants

Propellant Properties. The Small ICBM will carry approximately 33,000 pounds of solid propellant. The solid propellant used in this missile is a Class 1.1 explosive proprietary mixture containing the following compounds (and their approximate proportions): HMX (cyclotetramethylenetetranitramine) (48%); aluminum (elemental) (18%); proprietary plasticisers (12%); ammonium perchlorate (9%); TMEN (or BTTN) (6%). After curing, the solid propellant has a physical consistency resembling that of a hard pencil eraser.

Although the propellant will not spontaneously ignite, it will ignite when exposed to temperatures exceeding 500°F for more than 60 seconds.

Release Scenarios. The following sections examine the environmental impacts on air quality, water, and biological resources that could result from the release of solid propellant and its combustion products into the environment. Both mishap scenarios Case (1) and (2), could result in a fire involving only the solid propellant. Some or all of the propellant would burn rapidly (within a few minutes). If an explosion results from the fire, burning propellant dispersal is likely.

Consequence of Explosion. There is a remote possibility that a fire could ignite the solid missile stages causing a propellant explosion. This explosion would be primarily contained by the HML. However, debris and burned and unburned propellant could be scattered in a circular radius of 1,000 to 1,200 feet. In addition, small secondary fires are possible, depending on locational factors. Within this radius, damage to both flora and fauna is likely. Injury or loss of life to support personnel may occur. The effects of overpressure would extend to approximately 1,425 feet from the mishap. Structures within the 1,200-to-1,425 foot range would be subject to window breakage but would not receive other structural damage. The primary dangers to biota and people would be flying glass from broken windows and possible ear damage resulting from overpressure.

The intact RV would likely be among the debris ejected by the explosion. Tests done by the DOE indicate that the possibility of the explosion rupturing the RV is extremely remote.

Air Quality Impacts. The release of particles and vapors from a propellant fire results in a plume (cloud) that remains close to the ground. The major components of the cloud are hydrogen chloride (HCl) and carbon monoxide (CO), which are potentially toxic. Other components include water (H_20), nitrogen (N_2), carbon dioxide (CO_2), and hydrogen (H_2), which are essentially harmless. Hydrogen chloride gas from burning propellant may collide with and coat the aluminum oxide (AL_20_3). These toxic particles are transported downwind and gradually settle causing vegetative spotting and minor acidification of surface water supplies. Rain could scavenge residual HCl from the cloud, producing acidic precipitation.

The concentration of aluminum oxide particles in the centerline of the downwind plume was simulated by the ADPIC model. Concentrations at ground-level receptors (2 meters), 100, 200, and 300 meters aboveground were calculated 15, 30, and 60 minutes after the initiation of the propellant burn. Since the propellant was presumed to be totally burned in 20 minutes, the plume moves downwind as a "puff," exhibiting both lateral and vertical dispersion.

Ground-level exceedance of federal air quality standards for particulates occurs 1 kilometer (km) from the mishap 30 minutes after the initiation of the burn. Sixty minutes after the burn, the particulate concentration at the same location is well within standards. This demonstrates the "puff" character of the plume at this distance from the mishap. Particulate ground-level concentrations exceed federal standards in an area 7 km (4.4 mi) to 25 km (15.5 mi) from the mishap at various times after the burn initiation.

Particulate ground-level concentration exceeding federal standards are likely to occur at distances exceeding 25 km (15.5 mi); however, simulation by the model of ground-level

concentrations beyond 25 km (15.5 mi) is less accurate due to terrain-induced turbulence and dispersion. Ground-level receptors would be exposed to particulate concentrations exceeding federal standards for periods of time greater than 1 hour.

At higher elevations, the model does simulate more accurate particulate concentrations since ground-induced dispersion effects are lessened. As the plume rise carries most of the particulates up to the 100 (328 ft) to 200 meter (656 ft) elevation, atmospheric dispersion of the particulate at greater downwind distance can be estimated.

Particulate concentrations at 150 meters (492 ft) from ground level indicate that a substantial quantity of the total particulate mass is entrained in the plume. Therefore, the downwind deposition of the particulates resulting from gravitational and dispersive processes would occur over a broad area. Air quality standard exceedances cannot be predicted accurately at longer distances.

The major nonparticulate constituents of the cloud, such as carbon monoxide, water, nitrogen, carbon dioxide, and hydrogen would be dispersed by the plume and would create no significant impacts. As was demonstrated in the Morton Thiokol study (1978), it is likely that hydrogen chloride generated during the burn would be released as a vapor, some of which would coat the particles and be transported downwind. Gaseous hydrogen chloride not adsorbed to the particles would be transported downwind. It would react with other combustion products and naturally occurring compounds. If the mishap occurs during fog, rain, or temperatures near the dew point, gaseous hydrogen chloride may become chemically associated with water vapor, forming potentially serious acidic rain.

Water Quality Impacts. Minor surface water quality impacts may occur from the settling of aluminum oxide particles coated with hydrogen chloride and the fallout of hydrogen chloride vapors from the cloud. Surface water quality impacts from the exposed solid propellant are not expected since it is essentially insoluble in water. Potential minor local impacts could result from the runoff of motor fuels, lubricants, and fire-extinguishing materials from the mishap into surface waters.

Potential impacts on groundwater resulting from the mishap scenario are highly dependent upon local surface, subsurface, and deep groundwater system characteristics. Minor impacts could result from the movement of motor fuel, lubricants, and fire-extinguishing chemicals from the surface into shallow aquifers.

Biological Impacts. Minor adverse impacts on natural vegetation and animals could occur. Localized impacts on biota resulting from fire, fire extinguishing chemicals, and mechanical cleanup are anticipated. Local biota may be affected from deposition of hydrochloric acid aerosol droplets by spotting of vegetative growth; plant mortality; or burning of eyes, throat, skin, etc., for some animals.

Depending upon the geographical location, chemical constituency, and extent of surface water systems, aquatic biological systems downwind from the mishap could be affected by the deposition of aluminum oxide particles and the subsequent hydrochloric acid from those particles by rain or dew. Such impacts would be insignificant.

Human Health Effects. The downwind particulate plume would result in air quality exceedances, at various time intervals, at locations from 1 to 25 km from the mishap. Should the mishap coincide with outdoor human activities, persons exposed to the particulate could expect health effects, the severity of which would depend upon the particulate concentration, the length of exposure time, and other factors. Human health

effects could include respiratory impairment; burning of eyes, throat, or nose; and skin irritation.

5.3.2.2 Incidents Involving Liquid Propellant.

Propellant Properties. From 35 to 40 pounds (approximately 5 gallons) of hydrazine are carried in the PBV. Hydrazine is a colorless, oily liquid that fumes upon exposure to air at normal atmospheric pressure and is water soluble. Its vapors can be ignited at 126°F (flashpoint). For comparison purposes, the flashpoint of gasoline is minus 50°F. Liquid hydrazine can be ignited at various temperatures depending upon the surface. For example, it can ignite at 75°F on a surface containing rust and at 313°F on a stainless steel surface. When hydrazine fumes come in contact with the metal oxides of copper, lead, and manganese, they may also ignite spontaneously. Hydrazine forms highly combustible mixtures with air in concentrations of 4.7 to 100 percent at 212°F. Hydrazine vapors are slightly heavier than air and, depending upon meteorological conditions, they may flow along the ground and fill depressions.

Release Scenario. In either mishap scenario Case (1) or Case (2), the hydrazine tank could crack allowing the release of liquid hydrazine and hydrazine vapors. If an ignition source such as a diesel fuel fire is present, the hydrazine could burn. If an ignition source is not present, a small pool of hydrazine could form. Vapor release continues until either remedial action or total evaporation of the fuel occurs.

Consequences of Explosion Scenario. Liquid hydrazine is not a detonatable compound. Hydrazine vapor mixed with air could be ignited by sparks, causing deflagration (instantaneous combustion), but would not cause extensive damage to the missile system.

Air Quality Impacts. Adverse environmental impacts on local air quality in the immediate area are likely to occur after a mishap. Depending upon the conditions of the system after the mishap, hydrazine spilled from the tank may form a vapor or be ignited.

According to a computer model simulation done for this study, if all of the hydrazine is spilled into a liquid pool, the pool should totally evaporate in 18 minutes. The resulting vapor plume would travel downwind. The shape of the plume at 15, 30, and 60 minutes after the instantaneous release is shown in Figure 5.3.2-1. The value of the outermost contour of each plume is 0.03 ppm of hydrazine per cubic meter of air at 2 meters (approximately 6 feet) above ground level. The concentration of hydrazine at ground level in the interior portion of the plume lessens with time because of the lateral and vertical diffusion of hydrazine.

A hydrazine fire would produce nitrogen oxides, carbon dioxide, water, and unburned hydrazine. Since it is likely that a fire would involve more than just hydrazine, the rising hot exhaust cloud would be expected to contain other chemicals, particulates, and dust from the mishap site. The resultant downwind plume is likely to specifically resemble the plume described for the solid propellant burn. Any unburned hydrazine in the plume is likely to react with other compounds and be effectively reduced to zero concentration.

Water Quality Impacts. Although hydrazine could be released into surface water resources near the mishap site, the results of the modeling indicate that a liquid pool of the propellant would rapidly evaporate. Liquid hydrazine flowing away from the mishap would rapidly evaporate from the wetted area which, because of the small volumes of hydrazine involved, is not expected to exceed a 10-square-meter area. Hydrazine could reach surface water resources if diluted with water during an emergency response to the

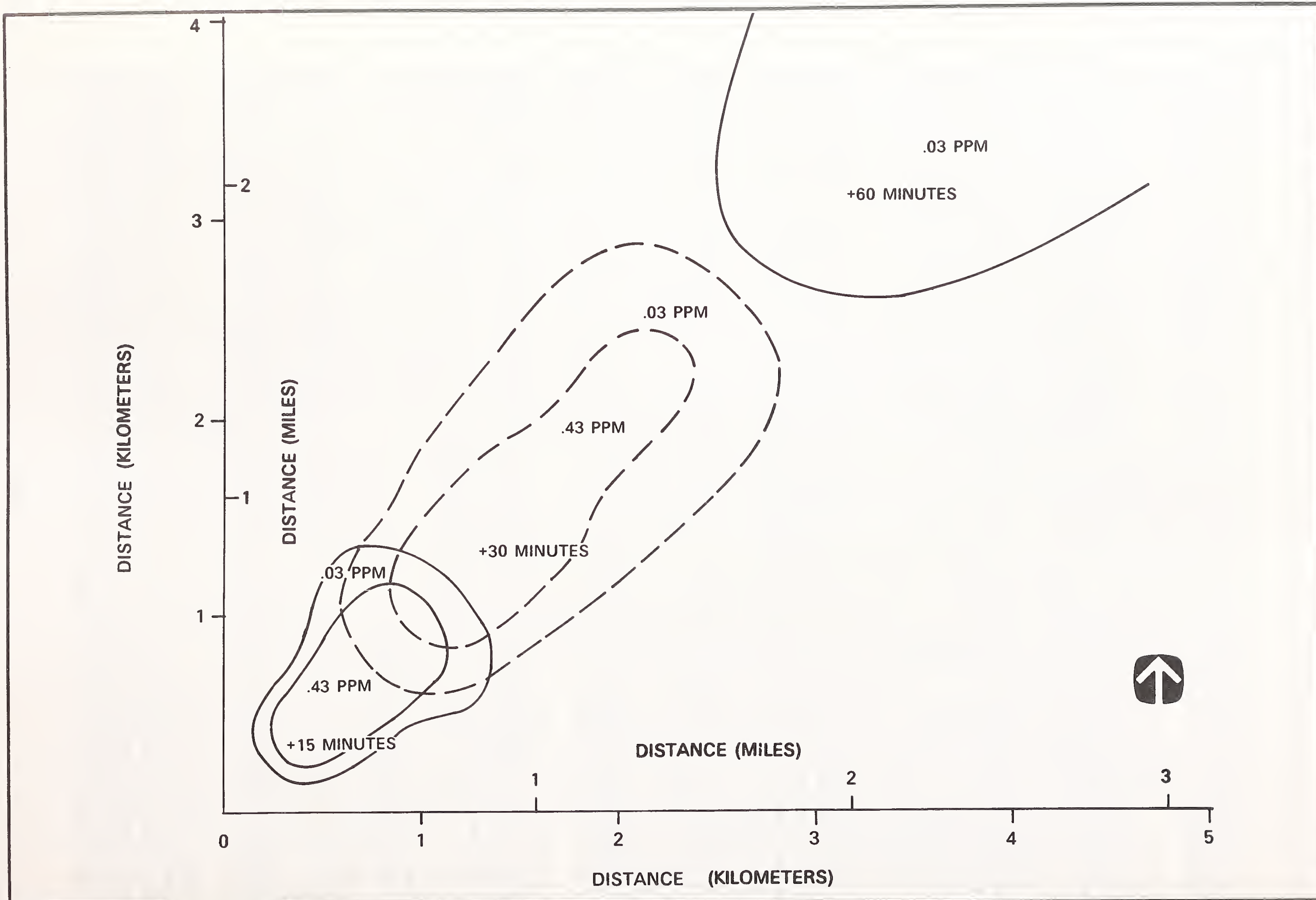

FIGURE 5.3.2-1 CONCENTRATION CONTOURS FOR EVAPORATED HYDRAZINE FOR 15 MINUTE, 30 MINUTE, AND GREATER THAN 60 MINUTE TIME PERIODS

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mishap. If mixed with water, the rate of evaporation would decrease due to the dilution of the hydrazine and chemical reactions within the aqueous solution. Although aqueous solutions of hydrazine have been shown to be toxic to biological resources, the small amount involved in this scenario is not to likely to result in concentrations high enough to have any long-term toxic effects.

Percolation of hydrazine fuel into the soil following a spill would be limited due to the small quantity (5 gallons) of hydrazine present in the system. This small quantity, coupled with the rapid evaporation rate predicted in the spill modeling, is likely to result in a small amount of hydrazine movement into the soil. Organic material in the soil is likely to react with hydrazine, breaking it down and effectively reducing the concentration of hydrazine in the soil. In addition, hydrazine is likely to evaporate from the surface of the soil once the pool of liquid existing above the soil has been evaporated. Because the hydrazine that has not evaporated would strongly adsorb to soil components, cleanup following a spill would be relatively simple.

Biological Impacts. The downwind movement of the vaporized hydrazine plume could have impacts on local biotic systems. The concentration and areal extent of the hydrazine vapor are dependent on the size of the leak and physical condition of the hydrazine at the mishap site, the wind speed and direction, relative humidity, the difference between the hydrazine pool temperature and ambient temperature, and the vertical mixing height.

A spill of hydrazine can be expected to kill or seriously damage vegetation in the limited area of the spill proper. Any resulting fire would kill grasses, herbs, shrubs and small trees, and burn the trunks and lower branches of large trees. Impacts on vegetation outside the immediate spill or fire area are unlikely due to the small quantity of hydrazine involved and the soil absorptive characteristics of this chemical.

Any animals exposed to sufficiently high concentrations of hydrazine vapor could experience burning of eyes, skin, and respiratory tract, and possibly systemic effects, as described for humans in the following section. These concentrations would be limited to a small area because of the small quantity of hydrazine involved.

Human Health Effects. Hydrazine is a strong irritant and may cause eye damage and respiratory tract inflamation. It can be absorbed through the skin, ingested, or inhaled. The 30-minute, short-term public exposure limit (SPEL) for hydrazine is 20 parts per million (ppm); SPEL is a standard index of human exposure tolerance. Under certain wind and atmospheric stability conditions, combined with a rapid hydrazine evaporation rate (1 pound per minute), the 20-ppm level might be experienced as far downwind as 1,500 feet.

People exposed to 20 ppm of hydrazine might experience irritation of eyes, nose, throat, or lungs, as well as dizziness and nausea. On short exposure, systemic effects involve the central nervous system. Resultant symptoms include tremors. As a comparison, a level of about 1,000 ppm is considered immediately hazardous to life. If hydrazine contacts the skin or eyes, it can cause severe local burns and dermatitis. In addition, it can penetrate skin to cause systemic effects similar to those produced when hydrazine is inhaled. If inhaled, the vapor causes local irritation of the respiratory tract, followed by systemic effects. Upon exposure to higher concentrations, convulsions and death may follow.

Although the toxicological results of hydrazine exposure are documented, the value of the "safe" dose of hydrazine is expressed in many different ways. The Air Force has used a value of 20 ppm hydrazine as its 30-minute SPEL as established by the National Academy of Sciences Committee of Toxicology. This SPEL is used to create the boundaries of a toxic corridor in which emergency evacuation areas downwind of inadvertent spills can be calculated.

Model simulations demonstrate that for this mishap scenario, a person located in the centerline of the plume would be exposed to concentrations of hydrazine exceeding both the 0.03 ppm-15 minute National Institute of Occupational Safety and Health (NIOSH) recommendation as well as the 20 ppm-30 minute SPEL guideline. Persons exposed at these levels could exhibit the previously described symptoms.

For this study, the 0.03-ppm contour (Figure 5.3.2-1) of the hydrazine plume was chosen to define the outer limit of the plume for the exposure level of concern. If a person is exposed to concentrations of hydrazine greater than 0.03 ppm for a time exceeding 15 minutes, it is assumed for the purposes of this study that they have been exposed to a dose of hydrazine exceeding NIOSH recommendations. The population situated along and immediately to each side of the centerline of the plume would be exposed to much greater concentration of hydrazine. Those persons closer to the origin of the spill would be exposed to greater concentrations than those farther from the origin, as the concentration of hydrazine would be reduced by turbulence, dispersion, and reactivity.

5.3.2.3 Combined Releases

There is a possibility that both the liquid and solid propellants could be released or burned simultaneously in a mishap. It is assumed that fire and/or explosion would accompany the mishap and result in complete involvement of the missile. Debris and fire could then be spread over the area immediately surrounding the site.

The environmental impacts likely to result from a combined burn would be equivalent to the impacts previously described for the solid propellant, except that the contribution of the hydrazine would moderately increase the toxicity of the burning propellant cloud. There is little potential for additional environmental impacts resulting from the combined propellants, their reaction products, or combustion products.

The environmental effects of the nuclear release scenario are to be interpreted as additive to the effects of the solid propellant or combined release scenarios as the radioactive particles are carried downwind by the plume from the fire.

5.3.2.4 Incidents Involving Nuclear Materials

In the context of this discussion, "release" refers to the escape of nuclear material that has been converted to aerosol form by the very high temperatures possible in a propellant fire, or material that has been scattered by an explosion of the solid propellant. There is no possibility of a nuclear detonation under any realistic mishap scenario.

Nuclear Material Properties. Plutonium isotope 239 (Pu-239) is the primary isotope of plutonium released. The Pu-241 content of weapons-grade plutonium provides a larger fraction of the total radioactivity. However, the radiation released by this isotope is beta radiation, which produces only one-twentieth the biological damage of the alpha particles emitted by Pu-239. In this analysis, all of the aerosolized plutonium was assumed to be Pu-239. The Pu-241 isotope is not considered further.

The types of radiation emitted by the isotopes of plutonium are alpha particles, beta particles, and gamma rays. Alpha particles are the primary decay product of plutonium and are, biologically, 20 times more damaging than beta particles and gamma rays. The alpha particle is very effective in causing biological damage. It deposits its energy over a very short distance (approximately 25 micrometers). This means that a small amount of plutonium embedded in human tissue via inhalation would result in a high-localized radiation dose. This would lead to continuous tissue damage as long as the plutonium is lodged in the same position. A beta particle or a gamma ray deposits its energy over a much longer distance. Therefore, the dose intensity and resultant biological damage is much less than that for an alpha particle.

The impact of the release of radioactive material (such as weapons-grade plutonium) is dependent on the physical and radiological characteristics of the material released. How and in what form the material is released, along with the local meteorological conditions and terrain at a mishap site, would determine the distribution of the released nuclear material. The radiological characteristics of the material would determine its effect on the human body and the flora and fauna of the affected region. Uranium is present in the warhead and would be dispersed with the plutonium in the event of a propellant explosion or fire. However, since plutonium has higher toxicity and body retention, it is the nuclear material discussed.

Release Scenarios. Either mishap scenario Case (1) or Case (2) could result in the burning of missile propellant in proximity to the RV, though this condition is unlikely to occur. While these cases are unlikely events, they could result in loss of containment of plutonium and aerosolization in a high-temperature propellant fire. For purposes of this study, the worst case would be a fire in which 1 percent of the nuclear material is dispersed as particulate plutonium dioxide in aerosol form.

Figure 5.3.2-2 depicts contours generated by a computer model that depicts potential radiation concentrations for a representative plutonium release in the deployment area.

Soil/Water Quality Impacts. One source of soil and water contamination from the plutonium released into the atmosphere is from resuspension of particles that have previously settled from the air onto the soil surface. Studies have shown that the amount of material resuspended is an insignificant fraction of the amount initially deposited on the ground. In the event of a mishap, most of the plutonium on the ground would be removed; however, some small quantities may remain following cleanup. The remaining plutonium is relatively insoluble and binds readily with soils to effectively limit its spread to groundwater. Surface water runoff from this soil after a mishap and the settlement of airborne plutonium particles on surface waters may pose a limited health risk to biota, depending upon the amount and concentration of plutonium reaching the surface waters.

Biological Impacts. The deposition of particulate plutonium oxides on vegetation may, in turn, lead to intake by humans. This may occur through direct consumption of particles on the surface of fruits or vegetables or through consumption of plants or animals that have assimilated plutonium.

Human Health Effects. No significant hazard from inherent radiation exists for civilians or military personnel involved in normal handling of nuclear weapons. The RV is designed, constructed, and maintained to preclude the possibility of leakage of radioactive material during operations. Current plans call for use of the same RV as that used for Peacekeeper. The normal exposure of Air Force operations personnel to

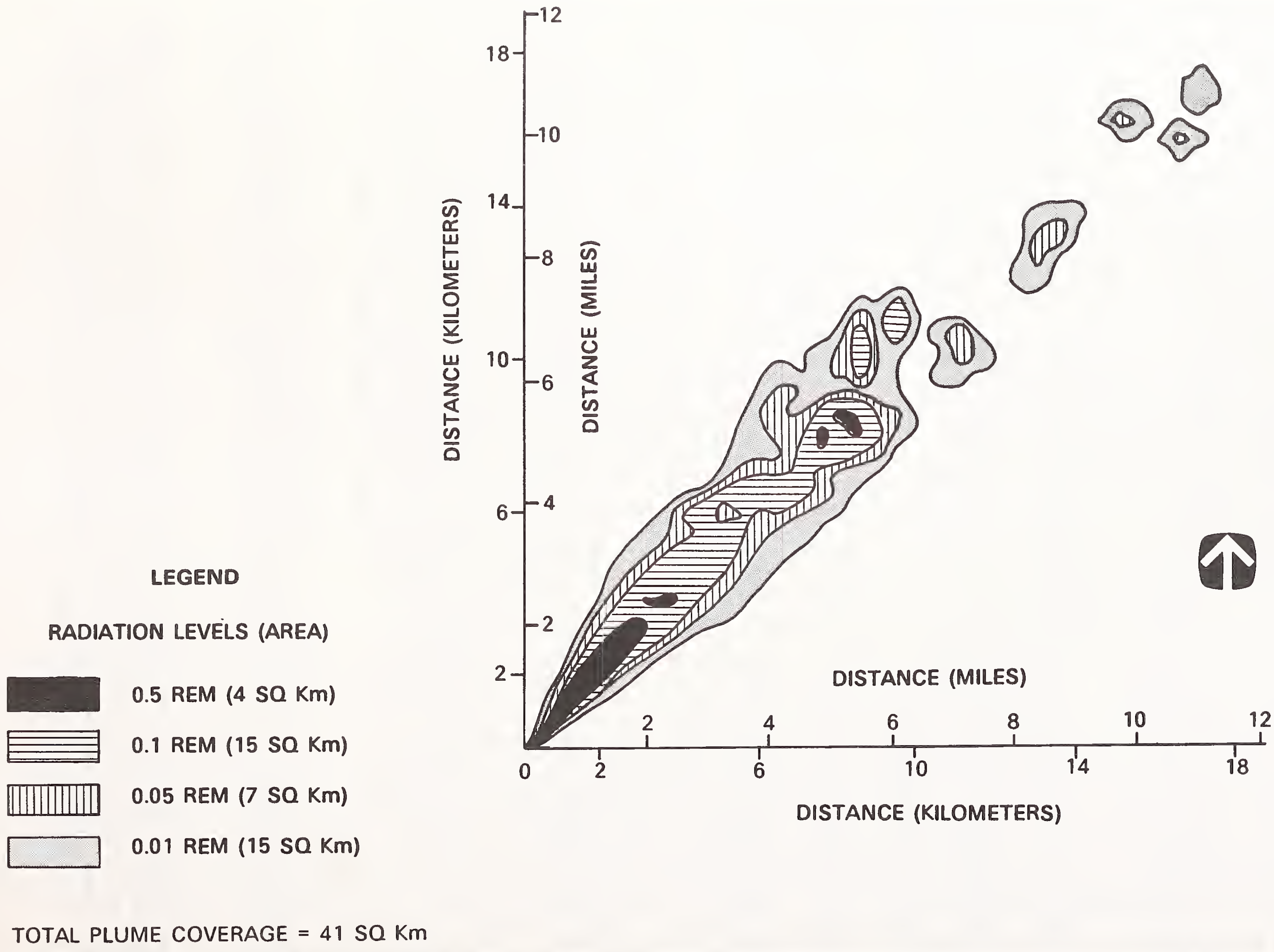

FIGURE 5.3.2-2 CONCENTRATION CONTOURS FOR AEROSOLIZED PLUTONIUM

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radiation from existing RVs has been measured and found to be well within established federal guidelines. Personnel monitoring will continue for the duration of the Small ICBM program.

The intake of plutonium by animals and man has been studied extensively. These studies have determined how much plutonium is retained in the body and how the retained portion of this long-lived radioisotope is distributed within the body. The body tissues that are the most critical (in terms of mortality risk) are bone and bone marrow, lungs, and liver.

The external exposure of humans to a cloud of plutonium is not as hazardous as inhalation and does not by itself result in significant health effects. Any external dose results primarily from the small fraction of low-energy photons emitted by the Pu-239. The alpha particles have such a short range (approximately 25 micrometers in skin) that they cannot reach the inner layers of the skin that are protected by a layer of dead, dry cells with a thickness exceeding the range of the alpha particle. The effects of external gamma rays and beta particles is small when compared to the internal effects of the inhaled materials.

Three critical tissues are associated with the mortality risk resulting from plutonium intake by humans. These have been designated as "critical" because they collect the plutonium taken in by inhalation or ingestion, and it remains in the tissues for a sufficiently long time to cause damage or death during the period of retention; the tissue immediately surrounding the plutonium is being continuously exposed to the alpha particles and other plutonium radiation.

A portion of the dispersed plutonium may settle out and accumulate where vegetables, fruits, grains, and livestock feed are grown, as well as in water supplies. However, since plutonium oxide is relatively insoluble, the amount of plutonium eventually reaching humans through the food chain would be small compared to that acquired directly through inhalation.

An analysis was conducted to predict the impact upon humans of a total release of the nuclear materials (as described above). The following assumptions were made: 1 percent plutonium (approximately 0.1 kilogram [0.22 lb]) is converted to aerosol form via propellant fire, and released over a period of 45 minutes; representative release site winds are in the range of from 5 to 8 mph; wind direction remains constant; total downwind exposure time at any point is approximately 1 hour; precipitation is negligible; human breathing rate is 0.0117 cubic feet per second and the human body retains 100 percent of the plutonium inhaled.

Assuming that (1) the plutonium release occurs adjacent to a town with a population density of 4,633 persons per square mile and (2) that statistically the population outside of the town is negligible, the equivalent probability of fatility is 14.2 fatalities per million of population based on aerosol distribution and 50-year dose data supplied by Lawrence Livermore Laboratory.

For comparison, expected fatalities which could occur as a result of various activities are the following:

- Normal cancer deaths - 170,000 per million.
- Working for 10 years in a coal mine - 19,000 per million.

- Lifetime smoking in excess of one pack of cigarettes per day - 15,000 per million.

- Dwelling in a large eastern U.S. city for 20 years - 3,600 per million.

- Traveling 300,000 miles by auto - 1,000 per million.

- Additional cancer deaths due to a HML mishap - 14 per million.

5.4 Conclusions

Two extremely unlikely assumptions, that a mishap occurs and that it results in the release of the total amount of available propellant and warhead materials, have been the basis for this analysis. Given these assumptions, the predicted environmental impacts would only be significant within the immediate mishap area with the exception of air quality. No significant impacts on water quality can be expected. Biological impacts would be similarly restricted to the nearby mishap area. Finally, human health impacts could be severe but only within the immediate mishap vicinity.

Environmental impacts of the abnormal Small ICBM safety events detailed in Section 5.2.2, Human Health Effects, are summarized in Table 5.4-1.

Table 5.4-1

Summary of Environmental Effects of Abnormal Small ICBM Mishaps

	Scenario			
Environmental Factor	Solid-Propellant Burn (Combined Solid/Liquid Propellant Burn)	Solid-Propellant Explosion	Liquid-Propellant Release	Nuclear Material Release
Air Quality	Possible acidic precipitation downwind Federal particulate standard exceeded	—	Local toxic concentration of hydrazine present exceeding NIOSH standards	—
Biology	Downwind vegetative spottings and irritation of dermal and respiratory tissue in animals Local damage due to fire	Possible local injury/mortality caused by flying debris or secondary fires	Tissue irritation to animals resulting from contact or inhalation of vapor Fire damage to vegetation	Limited risk to biota due to assimilation of contaminated surface water
Human Health and Safety	Mild aggravation of respiratory system of susceptible individuals	Possible local injury/mortality caused by flying debris or secondary fires	Tissue irritation resulting from contact or inhalation of vapor	Very small added risk of fatality from exposure-related health factors to people near the mishap
Water and Soils	Chance of motor fuel, lubricant, and fire-fighting chemical running off into local surface water and migrating into groundwater	Chance of motor fuel, lubricant, and fire-fighting chemical running off into local surface water and migrating into groundwater	Chance of motor fuel, lubricant, and fire-fighting chemical running off into local surface water and migrating into groundwater Possible surface contamination requiring aerating up to 10 square meters of soil in vicinity of mishap	Possible surface contamination requiring removal of up to 5,000 cubic meters of soil in the vicinity of mishap Possible local contamination of surface water due to runoff

6.0

6.0 AUTHORIZING ACTIONS

Table 6.0-1 provides a list of federal authorizing actions that may be required for the Small Intercontinental Ballistic Missile program.

Table 6.0-1

Federal Authorizing Actions

Authorizing Action	Typical Activity or Facility That May Require the Action	Authorizing Agency	Authority
Utilities Solid and Hazardous Waste			
Authority for Short-Term Storage of Small Quantities of Hazardous Waste, Hazardous Waste Identification Number	Generation during construction and temporary storage of small quantities of hazardous waste including expended or unusable oils and lubricants, machining fluids, cleaning agents, and adhesives.	U.S. Environmental Protection Agency	Resource Conservation and Recovery Act of 1976, 42 USC §6901 et seq. §6921; 40 CFR §261.5, 262.34
Registration, Packaging, and Manifest Requirements	Transportation of hazardous waste generated during construction from generation site to temporary storage site; transportation of propellants.	U.S. Department of Transportation, Federal Highway Administration	Hazardous Materials Transportation Act, 49 USC §1801 et seq.; Resource Conservation and Recovery Act of 1976, 42 USC §3003; 42 USC §6901 et seq.; 49 CFR §170-179; 40 CFR §262.30-262.33; 45 Fed. Reg. 51645
Approval of General Safety Plan and Facility-Specific Safety Plans	Storage and processing of explosives and propellants in facilities that are near inhabited buildings, public traffic routes, recreational facilities, utilities, petroleum storage facilities, or processing facilities for other explosives.	U.S. Department of Defense, Explosive Safety Board	Department of Defense Ammunition and Explosive Safety Standards Directive, 5154.45; Air Force Regulation 127-100
Transportation			
Highway Access Control Approval	Any construction involving new highway access improvements must be approved by the Secretary of Transportation.	U.S. Department of Transportation, Federal Highway Administration	Federal Aid for Highways, 23 USC §111

Table 6.0-1 Continued, Page 2 of 5

Authorizing Action	Typical Activity or Facility That May Require the Action	Authorizing Agency	Authority
Land Use			
Rights-of-Way Consultation	Need to occupy, use, or traverse land for roads or railroads, power and communication distribution systems, and pipelines through wildlife refuges.	U.S. Department of the Interior, Fish and Wildlife Service	Fish and Wildlife Coordination Act, 4 CFR 16 USC §661 et seq.; Department of Transportation Act of 1966, 80 Stat 931, PL 89-670; National Wildlife Refuge System Administration Act, PL 89-669; Coastal Barrier Resources Act, 16 USC §3501-3510
Right-of-Way Grant (U.S. Forest Service Managed Lands)	Federal project that requires the use/withdrawal of national forest land.	U.S. Department of Agriculture, Forest Service	National Forest Organic Legislation, 16 USC §475, Multiple-Use Sustained-Yield Act, 16 USC §528-531, Forest and Rangeland Renewable Resources Planning and Research Acts, National Forest Management Act, and Renewable Resource Extension Act, 16 USC §1600-1676; 36 CFR §261
Relocation Benefits Plan	If property owners are relocated as a result of the proposed project, a plan for relocation assistance will be developed.	U.S. Air Force	Uniform Relocation Assistance and Real Property Acquisition Act, 42 USC §4601 et seq.
Free-Use Permit	Quarries or borrow pits on public lands.	U.S. Department of the Interior, Bureau of Land Management	Materials Act of 1947, 30 USC §601-604

Table 6.0-1 Continued, Page 3 of 5

Authorizing Action	Typical Activity or Facility That May Require the Action	Authorizing Agency	Authority
Cultural and Paleontological Resources			
Section 106 Consultation and Comment	Project activities that affect properties with historic, architectural, or cultural value which are listed or eligible for listing in the National Register of Historic Places.	Advisory Council on Historic Preservation	National Historic Preservation Act of 1966, as amended, 16 USC §470 et seq.; Advisory Council on Historic Preservation, 36 CFR §800; National Register of Historic Places, 36 CFR §60; Protection and Enhancement of the Cultural Environment, Executive Order 11593
Consultation	Project activities that affect Native American religious and/or heritage practices and sites.	Native American religious leaders	American Indian Religious Freedom Act, 42 USC §1996 et seq.; Archeological Resources Protection Act, PL 96-95
Permit to Survey, Excavate, Analyze, and Curate Archaeological Resources	Project activities that affect cultural resources.	U.S. Department of the Interior, National Park Service, Interagency Archaeological Services	Archeological Resources Protection Act, PL 96-95
Cooperative Agreement for Construction and Operation on Historic Trails	Project actions that affect historic trails.	U.S. Department of the Interior, National Park Service	National Trails System Act, 16 USC §1241 et seq.

Table 6.0-1 Continued, Page 4 of 5

Authorizing Action	Typical Activity or Facility That May Require the Action	Authorizing Agency	Authority
Biological Resources and Threatened and Endangered Species			
Section 7 Consultation on Threatened and Endangered Species	Activities and facilities that may affect threatened or endangered species or their critical habitat.	U.S. Department of the Interior, Fish and Wildlife Service	Endangered Species Act, 7; 16 USC §1531-1536 et seq.; 50 CFR §402; Proposed Rules in 48 Fed. Reg. 29990
Consultation on Effects on Fish and Wildlife	Modification, control, or impoundment of a surface water body over 4 hectares. Must consult with federal and state wildlife agencies.	U.S. Department of the Interior, Fish and Wildlife Service	Fish and Wildlife Coordination Act, 16 USC §661-666
Wetlands Assessment	Construction in, modification of, or impacts to wetlands is not allowed unless there is no practicable alternative. Must notify federal, state, and local agencies of expected impacts, alternatives considered, and mitigations.	U.S. Department of the Interior, Fish and Wildlife Service; U.S. Army Corps of Engineers	Executive Order 11990
Water Resources			
Section 404 (Dredge and Fill) Permit, Consultation	Discharge of dredged or fill material into waters of the United States at specified disposal sites, especially for impoundments, bridge crossing improvements, or where cable or pipe corridors traverse streams and wetlands.	U.S. Army Corps of Engineers, in consultation with U.S. Environmental Protection Agency and U.S. Department of Agriculture, Fish and Wildlife Service	Federal Water Pollution Control Act of 1972, as amended (FWPCA), 404, 33 USC §1344, 33 CFR §320-330, 40 CFR §230; Executive Orders 11988 and 11990; Fish and Wildlife Coordination Act, 16 USC §661-666c
Floodplain Avoidance	Construction activities in floodplains or wetlands.	U.S. Air Force	Executive Order 11988

Table 6.0-1 Continued, page 5 of 5

Authorizing Action	Typical Activity or Facility That May Require the Action	Authorizing Agency	Authority
Section 10 Permit	Construction of structures such as impoundments, bridge improvements, and cable components in or over any navigable water, the excavation from or depositing of material in such waters or any other work affecting the course, location, condition, or capacity of such waters.	U.S. Army Corps of Engineers, in consultation with U.S. Environmental Protection Agency and U.S. Department of Agriculture, Fish and Wildlife Service	Rivers and Harbors Act of 1899, §10, 33 USC §403, 33 CFR §320-330, 40 CFR §230; Fish and Wildlife Coordination Act, 16 USC §661-666c
Approval of Spill Prevention Control and Counter-Measure Plan	Storage or transportation of oil (i.e., in the form of gasoline and diesel fuel or in any other form) at construction sites.	U.S. Environmental Protection Agency	Federal Water Pollution Control Act, 33 USC §1251 et seq., §1321(j)(1)(c); 40 CFR §112
Noise			
Consultation	Federal activities resulting in noise that may jeopardize health or safety. Equipment must meet federal noise emission standards.	U.S. Environmental Protection Agency	Noise Control Act of 1972, as amended by the Quiet Communities Act of 1978, 42 USC §4901 et seq., particularly 42 USC §4903

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B.S., 1986, Civil Engineering, U.S. Air Force Academy, Colorado Springs, Colorado
Years of Experience: 2

Raj Mathur, Principal Social Scientist, Tetra Tech, Inc.
B.A., 1957, Geography, Punjab University, India
M.A., 1960, Economics, Punjab University, India
Ph.D., 1972, Geography, University of Minnesota, Minneapolis
Years of Experience: 27

David A. McPhee, Chief, Environmental Protection Management Branch, U.S. Air Force, AFRCE-BMS/DEVE
B.S., 1970, Aeronautical Engineering, San Jose State College, California
Years of Experience: 16

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B.S., 1969, Biology/Chemistry, University of Windsor, Ontario, Canada
Ph.D., 1973, Ecology, University of Notre Dame, South Bend, Indiana
Years of Experience: 16

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B.S., 1979, Geology, Indiana University, Indianapolis
M.A., 1984, Geology, Indiana University, Bloomington
Years of Experience: 8

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B.A., 1984, Geography, University of California, Santa Barbara
B.A., 1984, Environmental Studies, University of California, Santa Barbara
Years of Experience: 3

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B.A., 1976, Psychology, University of Central Florida, Orlando
M.A., 1981, Experimental Psychology, University of South Florida, Tampa
A.A.S., 1983, Information Processing, Riverside City College, Riverside, California
Years of Experience: 11

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B.A., 1972, Government, Oberlin College, Ohio
Ph.D., 1979, Economics, University of Maryland, College Park
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B.A., 1965, Business Commerce and Administration, North Central College, Naperville, Illinois
M.A., 1967, Economics, Roosevelt University, Chicago, Illinois
Ph.D., 1972, Economics, University of Arizona, Tucson
Years of Experience: 19

Anantaramam Peddada, Staff Atmospheric Scientist, Tetra Tech, Inc.
B.S., 1961, Geology, Physics, and Chemistry, Government Arts College, Rajahmundry, India
M.S., 1963, Geology, Andhra University, Waltair, India
M.S., 1972, Geology, State University of New York, Albany
M.S., 1979, Urban Environmental Studies, Rensselaer Polytechnic Institute, Troy, New York
Years of Experience: 15

Richard R. Reinecke, Staff Engineer, Honeywell Space and Strategic Avionics Division
B.S., 1951, Physics, Loyola University, New Orleans, Louisiana
M.S., 1952, Physics, Vanderbilt University, Nashville, Tennessee
Years of Experience: 24

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B.A., 1977, Psychology and English, University of Richmond, Virginia
J.D., 1982, Law, Emory University, Atlanta, Georgia
Years of Experience: 5

Scott Rice, Associate Geologist, Tetra Tech, Inc.
B.S., 1984, Geology, University of Minnesota Institute of Technology, Minneapolis
Years of Experience: 2

Raymond Rodrigue, Regional Director, Tetra Tech, Inc.
B.S., 1963, Engineering, University of Southern California, Los Angeles
M.S., 1965, Civil Engineering, University of Southern California, Los Angeles
Ph.D., 1969, Civil Engineering, University of Southern California, Los Angeles
Years of Experience: 26

John R. Sabol, Civil Engineer, U.S. Air Force, AFRCE-BMS/DEVE
B.S., 1958, Civil Engineering, Lafayette College, Easton, Pennsylvania
J.D., 1972, Western State University, College of Law, Anaheim, California
Graduated, 1982, Air War College, Air Force University, Maxwell Air Force Base, Alabama
Years of Experience: 34

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B.S., 1982, Geology, California State University, Bakersfield
M.S., 1986, Geophysics, University of California, Riverside
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Janet St. Amant, Quality Control Coordinator, Tetra Tech, Inc.
Years of Experience: 14

Peter Sturtevant, Senior Water Resources Scientist, Tetra Tech, Inc.
B.S., 1971, Biology, University of California, San Diego
M.S., 1974, Aquatic Ecology, University of Washington, Seattle
Years of Experience: 13

Carl R. Swartz, Principal Scientist, Tetra Tech, Inc.
B.A., 1942, Business Administration, Chico State College, California
M.A., 1947, Economics, University of Nevada, Reno
Sc.D., 1953, Economics, University of Paris, France
Years of Experience: 31

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Years of Experience: 4

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B.A., 1970, Biology, Williams College, Williamstown, Massachusetts
Ph.D., 1978, Biology, University of California, Riverside and San Diego State University
Years of Experience: 11

Patricia A. Turnham, Publications Manager, Tetra Tech, Inc.
A.A., 1974, Business Administration, Orange County Community College, Middletown, New York
Years of Experience: 13

James G. Van Ness, Major, U.S. Air Force, Attorney, AFRCE-BMS/DES
B.S., 1971, Distributed Studies, Iowa State University, Ames
J.D., 1974, University of Iowa School of Law, Iowa City
LL.M., 1984, Law and Marine Affairs, University of Washington School of Law, Seattle
Years of Experience: 13

Jeff Vitucci, Senior Economist, Niehaus and Associates, Inc.
B.A., 1974, Environmental Studies, California State University, San Jose
M.A., 1979, Economics, University of California, Santa Barbara
Years of Experience: 9

Peter Walsh, Lieutenant Colonel, U.S. Air Force, Director of Environmental Planning, AFRCE-BMS/DEV
B.S., 1967, Engineering, San Diego State University, California
M.S., 1968, Civil Engineering, Texas A&M University, College Station
M.BA, 1981, Auburn University, Montgomery, Alabama
Years of Experience: 19

Lawrence J. Watson, Program Director, Tetra Tech, Inc.
B.Ed., 1960, Science Education, Chicago State University, Illinois
M.A., 1967, Physical Geography (Climatology), Chicago State University, Illinois
Ph.D., 1975, Biogeography and Remote Sensing, University of Oklahoma, Norman
Years of Experience: 19

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Years of Experience: 4

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B.A., 1967, Mathematics, University of California, Los Angeles
Years of Experience: 20

8.0

8.0 LIST OF RECIPIENTS

The environmental issues addressed in this Draft Environmental Impact Statement were initially identified by Air Force and contractor personnel who have experience with programs of similar scope. These issues were then presented at scoping meetings held between March and April 1987 in Great Falls, Lewistown, Conrad, and Helena, Montana. Issues and comments identified through this scoping process have been included in the evaluation of environmental consequences of the proposed program. The list of recipients includes those individuals that attended the scoping meetings, interested federal, state and local agencies, Native American groups, and others who have expressed an interest in receiving the document. The list also includes the governor of Montana, United States senators, and representatives from Montana. Copies of the draft document have been provided to libraries throughout the nine-county deployment area, including the state library in Helena, Montana.

8.1 Elected Officials

8.1.1 U.S. Senate

Honorable Max Baucus
Honorable John Melcher

8.1.2 U.S. House of Representatives

Honorable Ron Marlenee
Honorable Pat Williams

8.1.3 State of Montana Officials

Honorable Ted Schwinden, Governor

Honorable Gary Aklestad
Montana State Senate

Honorable Delwyn Gage
Montana State Senate

Honorable Allen Kolstad
Montana State Senate

Honorable Richard Manning
Montana State Senate

Honorable Joe Mazurek
Montana State Senate

Honorable Darryl Meyer
Montana State Senate

Honorable Ted Neuman
Montana State Senate

Honorable Tom Rasmussen
Montana State Senate

Honorable Gene Thayer
Montana State Senate

Honorable Mike Walker
Montana State Senate

Honorable Bob Williams
Montana State Senate

Honorable Jan Brown
Montana House of Representatives

Honorable Tom Bulger
Montana House of Representatives

Honorable John Cobb
Montana House of Representatives

Honorable Gene DeMars
Montana House of Representatives

Honorable Gene Donaldson
Montana House of Representatives

Honorable Edward J. Grady
Montana House of Representatives

Honorable Larry Grindle
Montana House of Representatives

Honorable Hal Harper
Montana House of Representatives

Honorable Harriet Hayne
Montana House of Representatives

Honorable Loren Jenkins
Montana House of Representatives

Honorable Rex Manuel
Montana House of Representatives

Honorable Lloyde J. McCormick
Montana House of Representatives

Honorable Joan Miles
Montana House of Representatives

Honorable Ron Miller
Montana House of Representatives

Honorable Gerald D. Nisbet
Montana House of Representatives

Honorable Helen G. O'Connell
Montana House of Representatives

Honorable John Phillips
Montana House of Representatives

Honorable Paul Pistoria
Montana House of Representatives

Honorable Harold Poulsen
Montana House of Representatives

Honorable William Strizich
Montana House of Representatives

8.1.4 Local Officials

Mayors
Honorable Roger Anderson
City of Great Falls
Honorable Oscar Biegel
City of Harlowton
Honorable Irene Spangler Gottfried
City of Shelby
Honorable James A. Hamilton
City of Choteau
Honorable Thomas Hammerbacker
City of Conrad
Honorable John P. Humphrey
City of Lewistown
Honorable Ronald S. Jovanovich
City of Fort Benton
Honorable Robert W. Patterson
City of Denton
Honorable Russ Ritter
City of Helena
Honorable Lloyd Schmitt
City of Stanford
Cascade County Planning Director
Roger B. Sanders

Cascade County Sheriff's Office
Barry Michelotti

Cascade County Commissioners
Richard G. Gasvoda
Patrick L. Ryan
Jack T. Whitaker

Cascade County Planning Director
Roger B. Sanders

Cascade County Sheriff's Office
Barry Michelotti

Choteau City Manager
Stanley L. Brown, Jr.

Chouteau County Commissioners
Lloyd L. Allen
Charles Danreuther
Henry I. Grossman

City of Conrad
Gary Dent, Police Chief
Marvin Klette, Fire Chief

City of Great Falls
Robert Jones, Police Chief
Mike Karlovich, Public Safety Director
Richard Levendowski, Fire Chief

City of Lewistown
R. Dunnington, Police Chief
Sonny Moline, Fire Chief

Conrad City Council
Peter Hauer

Fergus County Commissioners
Otto Jensen
Alfred B. Miller
Robert K. Phillips

Fergus County DES
Thomas Bersuch

Great Falls City Attorney
David Gliko

Great Falls City Commissioners
Ardith Aiken
Judy Deck
Shirley Kuntz
Loren Seaver

Great Falls City-County Planning Department
John Mooney

Great Falls City Manager
G. Allen Johnson

Great Falls Community Development Department
Cheryl Bruskotter
Mike Rattray

Judith Basin County Commissioners
Arnold Haack
Russell Hodge
Barbara B. Skelton

Lewis and Clark County Commissioners
Jim Campbell
Bob Decker
Linda Stoll-Anderson

Lewistown City Alderman
Al Heckford
Lewistown City-County Planning Board
Tom Dimke

Lewistown City-County Planning Office
Elly Walkowiak

Pondera County Commissioners
Kenneth G. Duncan
Donald McClain
LaNelle E. Petersen

Pondera County Health Department
Doris Morgan
H.J. Stordahl

Teton County Commissioners
Brad DeZort
William R. Jones
Scott Mangold

Toole County Commissioners
J.G. Gottfried
Tom Sherrard
Harry A. Simons

Wheatland County Commissioners
Edgar Lanston
David Miller
John R. Nelson

Wheatland County Farm Bureau
Loren H. Morley

8.2 Public Agencies

8.2.1 Federal Agencies

Advisory Council on Historic Preservation, Washington, DC
Advisory Council on Historic Preservation, Denver, Colorado
Federal Highway Administration Helena, Montana
U.S. Army Corps of Engineers Omaha, Nebraska
U.S. Bureau of Indian Affairs Billings, Montana
U.S. Bureau of Indian Affairs Pablo, Montana
U.S. Bureau of Land Management Billings, Montana
U.S. Bureau of Land Management Butte, Montana

U.S. Bureau of Land Management
Lewistown, Montana
U.S. Bureau of Land Management
Miles City, Montana
U.S. Bureau of Reclamation
Billings, Montana
U.S. Environmental Protection Agency
Denver, Colorado
Helena, Montana
Washington, DC
U.S. Fish and Wildlife Service
Helena, Montana
U.S. Forest Service
Great Falls, Montana
U.S. Forest Service
Helena, Montana
U.S. Forest Service
Kalispell, Montana
U.S. Forest Service
Missoula, Montana
U.S. Geological Survey
Billings, Montana
U.S. Geological Survey
Helena, Montana
U.S. National Park Service
West Glacier, Montana
U.S. National Weather Service
Great Falls, Montana
U.S. Soil Conservation Service
Bozeman, Montana
U.S. Soil Conservation Service
Conrad, Montana
U.S. Soil Conservation Service
Great Falls, Montana
U.S. Soil Conservation Service
Lewistown, Montana

8.2.2 State Agencies

Montana Bureau of Mines and Geology, Butte
Montana Department of Administration, Helena
Montana Department of Commerce, Helena
Montana Department of Community Affairs, Helena
Montana Department of Education, Helena
Montana Department of Fish, Wildlife and Parks, Billings, Bozeman, Great Falls, Helena
Montana Department of Health and Environmental Services, Helena
Montana Department of Highways, Great Falls
Montana Department of Highways, Helena
Montana Department of Labor and Industry, Helena
Montana Department of Natural Resources and Conservation, Helena
Montana Department of Public Service Regulations, Helena
Montana Department of Revenue, Helena
Montana Department of State Lands, Helena
Montana Environmental Quality Council, Helena
Montana Legislative Fiscal Analyst, Helena
Montana National Guard, Helena
Montana Office of Public Instruction, Helena
Montana State Historic Preservation Office, Helena
Montana State Library, Helena
Montana State University, Water Resources Research Center Bozeman
Montana Department of Highways, Billings

8.2.3 Local Agencies

Conrad School District, Montana
Fort Benton Public Schools, Montana
Great Falls Public Schools, Montana
Lewistown School District, Montana

8.3 Native American Groups

American Indians Against Desecration
Indianapolis, Indiana
Assiniboine and Sioux, Poplar, Montana
Blackfeet Agency, Browning, Montana
Chippewa-Cree, Box Elder, Montana
Confederated Salish and Kootenai
Pablo, Montana
Crow Tribal Council, Montana
Fort Belknap Community Council
Harlem, Montana
Indian Law Support Center
Boulder, Colorado
Kootenai Tribal Council
Bonners Ferry, Idaho
Little Shell Band, Lame Deer, Montana
Montana Intertribal Council, Billings
National Congress of American Indians,
Washington, DC
Nez Perce Tribal Executive Council
Lapwai, Idaho
Northern Cheyenne Tribal Council
Lame Deer, Montana
Shoshone-Bannock, Fort Hall, Idaho
Shoshone Tribal Council
Fort Washakie, Wyoming
Turtle Mountain People
Belcourt, North Dakota

8.4 Other Organizations

American Red Cross, Great Falls,
Montana
American Wilderness Alliance
Bozeman, Montana
Bozeman Alliance for a Nuclear Free
Future, Montana
Cascade County Health Department,
Montana
College of Great Falls, Montana
Committee of the '80s
Great Falls, Montana
Committee of the '90s
Great Falls, Montana
Common Cause, Helena, Montana
Conrad Chamber of Commerce, Montana
Construction and General Laborers
Local 1334, Great Falls, Montana
Defenders of Wildlife, Missoula, Montana
Democratic Central Committee,
Great Falls, Montana
First Interstate Bank of Great Falls,
Montana
Great Falls Catholic Schools, Montana
Great Falls Chamber of Commerce,
Montana
Great Falls Federal Savings and Loan,
Montana
Last Chance Peacemaker's Coalition
Helena, Montana
Lewistown Chamber of Commerce,
Montana
Montana AFL-CIO, Helena, Montana
Montana Association of Counties, Helena
Montana Association of Realtors, Helena
Montana Contractor's Association,
Helena
Montana Environmental Information
Center, Helena
Montana Low Income Coalition, Helena
Montana Natural Heritage Program,
Helena
Montana People's Action, Helena
Montana Power Company, Butte
Montana Society of Natural and Earth
Sciences, Bozeman
Montana Tax Foundation, Inc., Helena
Montana Wilderness Association, Helena
Montana Wildland Coalition, Malta
Montana Wildlife Federation, Bozeman
Montana Wildlife Organization, Helena
National Audubon Society, Helena,
Montana
Peace Legislative Coalition, Missoula,
Montana
Physicians for Social Responsibility
Butte, Montana
Sierra Club, Bozeman, Montana
Sierra Club, Lander, Wyoming
U.S. Federal Emergency Management
Agency, Washington, DC
Wilderness Society, Bozeman, Montana

8.5 Individuals That Attended Scoping Meetings (not including public officials)

Milo W. Aasved
Bunny Albers
Ann Aldrich and Jim Osen
Lloyd L. Allen
Ed Althoff
Carol, Theodore, and Walter Anderson
Don Andersen
Larry Antonich
Ronald L. Archar
Paul Armstad
Grover R. Austad
Ron Austad
Phillip E. Bachmeier
William Bacon
George and Thelma Bakas
Jack Banger
Fred Banka
John F. Barber
Joe Bauman
Oscar F. Bechtel
Al Bell
Steven and Kathy Berberet
Clayton Berg
Kathie Boner
Donald C. Bost
Robert and Bernice Boucher
Lucien E. Bourcier
William L. Bourret
John Bowekamp
John H. Boysun
Branch B. Brady
Phil Brooks
Carol A. Brown
David R. Brown
Joseph Bryan
Richard E. Buller
James R. Burdette
Darryl Burditt
Patty Busko
Dave and Ken Byerly
Roscoe F. Canon
Judith H. Carlson
Leon and Rae Carpenter
Arthur Carter
Ron Casey
John A. Cavanaugh
Nick and Joan Cetto
Laynn Chase
M.P. Clark, Jr.
Scott Classen
Chip Clawson
Dan Cobb
E.B. Cogswell
Jay Cole
Carol Collins
Robert Clark Conley
D.P. Connors
Bill Conrad
Larri Coyle
Rondy E. Crawford
Scott Crichton
Will Crough
Jim Cummings
Terri Lynn Dahl
Robert J. Dahle
Ahmedg Dana
Mark Daniels
Lorrin A. Darby, Jr.
Dale A. Davidson
Lark A. Davis
Marvin DeBuff
Jim Delaney
Ron Denzer
Tim DeSarlais
Jeane Deshon
Christine Deveny
Sue Dickenson
Art Dickhoff
Sharon R. Dickhoff
Dolores Didier
Eugene Discher
Roger Donely
Al Donohue
Robert A. Donovan
Richard D. Ecklund
Douglas Q. Ekegren
Tom Ellerhoff
Tom Elliot
Jim Ellis
Robert R. Emrick
Gene and Marge Erlandson
Alan Evans
Rick Evans
Diane Farmer
Phyllis A. Faulkner
Eugene Fenderson
Robert S. Fitzgerald
Maurice Fladstol
John J. Flynn
Ralph and Donna Fornfeist
James W. Fox
George M. Galie

Michael W. Garrett
Brian F. Garrity
Keith Ginther
Rae Ginther
Loren Glade
Opal Gladshot
Sharon Glover
Mark Good
Velma Good
Kerry E. Gray
Dennis and Lilly Grigsby
Ryan Grubb
Kathy Guehlstorff
James R. Guthrie
Gene and Lois Habets
Glenn Hadden
Scott Haight
Mila Halvorsen
Nancy Jo and Mary B. Hamilton
Jack Hane
Bretas Harald
Alison Harmon
Bill Harp
John Harper
Don Harriot
Thomas and Lavonne Hastings
Linda Hays
Esther Heckford
Charlie Heit
Larry and Becky Heimgartner
Chester Helen
Kathy Helland
Mr. and Mrs. I. Hellebust
H. Alan Herrig
Jerry Hess
Gordon Hickman
David Hilde
Gary and Darlene Hindoien
Wayne M. Hirsch
Grace Hodge
M. Hoffer
Harold Hofmann
Jack Holland
Norman M. and Dorothy J. Holland
Reverend Bob Holmes
Lora and Dana Huestis
James Humphrey
Ron Isaacson
Janis Jackson
Zarina Jackson
Sherman Janke
Christine Jenkins
Richard E. Jergesen
Ray Jergeson
Anita Johnson
Bill Johnson
Dick Johnson
Lester Johnson
Paul A. Johnson
Peter Johnson
Ray Johnson
Robert L. Johnson
R.F. Jorgensen, Jr.
Frank A. Kamp
Charley and Sally Karinen
Dale L. Keil
Harry W. Keith
Richard Kellogg
Bob Killham
Chester Kinsey
Ken Knudson
George W. Kokoruda
Sparky Kottke
A.G. and R.E. Krillenberger
Paul Kronebusch
Kraig Kruger
Recie Kruger
John and Colleen Kunz
James M. Labriola
Tammy Lacey
Edward J. and Chris Larson
Florence Larson
Hugh Larson
Golda H. Leininger
Kathy LeTellier
Richard Levandowski
Ricky D. Linafelter
Arnold Lindberg
Paul F. Linehan
Larry and Leona Linn
Joseph Liuzza
Joseph Loncki
Orvin Lotabauer
John E. Lubinus
Holly Luck
LeAnn Lusty
Charles E. Lyndes
David D. Madsoa
Jerry A. Majerus
Stephen Maly
Elizabeth D. Mancoronal
Morris O. Mancoronal Jr.
Dan Mann
Bruce Marsden
William Marsik
Janet D. Martin

Larry Martin
Bob Martinka
Duane Mason
Tom Mather
Gordon H. and Marjorie Matheson
Sheila Maybanks
Joanne Maynard
Jeanette McClain
S.T. and Eileen McFarland
Michelle McGorern
Scott McIntosh
Frank C. McKenna
Dave McLaughlin
Joe McQuire
Terry and Dorothy Meehan
R. Cory Merrill
Myrna Mintyala
Ann Mitchell
Gile Mitchell
Harry B. Mitchell
James and Becky Mitchell
J.B. Molineux
Richard R. Mooney
Col (Ret) Jack K. Moore
Joseph Moore
Robert J. Moretti
Jay P. Morgan, 1st Lt, USAF
Lynne Morgan
Lucille Mortensen
Carol Mosher
Anne Moylan
Mary D. Munger
Ken Munski
Leroy Musick
Daniel L. Nelson
Lloyd C. Neudisk
George B. Nilson
Roger C. Nye
Robert H. Oakland
Richard and Anna Mae O'Brien
David Oien
Orville and Gudrun Oien
Rev. K.H. Olson
John Ortwein
Chuck Otto
Ray Ozmon
Bill Parker
Donald E. and Margaret Parker
Robert A. Passon
R.L. Patten
D.W. Paulson
Pete and Harriette Pederson
D.F. Pennell
Alan J. Perdigao
Howard and Carol Peretti
Lester R. Peters
Russel D. and Beverly Petersen
Jerry A. Peterson
Lori K. Peterson
Lydia Phillips
S.D. Piper
Dick Pompa
William G. Preston
Robert E. Purdy
Robert L. Rachal
Jim Raw
Joseph R. Raya
Charles A. Ream
R. Karl Rembe
Sylvester A. and Augusta Ries
Dell Riggs
Roger and Olive Robison
Del Rodrigues
Phil Rodriguez Sr.
Sam and Jaye Rodriguez
Noel and Irene Rosetta
R.D. Rowe
Alice Ruckman
Mr. and Mrs. E.S. Rutherford
Tim Ryan
John J. Sabo
Ralph and Vernera Salisbury
Eileen Sansom
Jeanie Schmidt
Reid Seastrand
James E. Senkler
Dennis M. Seyfert
Lee Shanklin
Jeff Shelden
Lois Sheldon
Jo Shipman
Terri Lynn Skaggs
Robert J. Sletten
Robert T. Smith
Susan Snyder
Raymond Solomon
Ted Soltis
Noel Spangelo
Tom Sparby
Tim Speyer
Alice Stanley
Paul Stephens
Elmer L. Stewart
Gary O. Stewart
Diane Stinger
Joan Stockton

Norman E. Stordahl
Ralph C. Stordahl
Milo G. Stubbs
P. Sullivan
Diana S. Talcott
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Ralph Thayer
Fred and Dot Thiel
Randy Thill
Joan Thomas
T.H. Thomas
Don Thompson
Mike Thompson
William D. Thornby
JoAnne Peterson Thun
Guy R. Tindall
Ron Torgerson
Helen M. Gemar Trebesch
Greg M. Trenacy
Herb Tronson
Mat Truell
Connie Tryon
James R. Tucker
Butch Turk
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H.F. Uhlrich
Gerald Vandenacre
Hazel Vandenacre
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Jerry Walston
Wayne E. and Lorraine Walston
Virginia Walton
Jerry Weast
Theodora Weatherwax
Eleanor Wend
Warren Wenz
Wayne Wetzel
Gordon and Janet Whirry
Onno Wieringa
William and Catherine Wilkerson
Terry Will
Dennis William
John Williams
Gary W. Willis
Wesley M. Wills
Rob R. Wilson
Betty Woods
Christine Workman
R.A. Worthington
Deb Yerkes
Carol R. Young
Roger W. Young
Kent Yunker
Joe Zahler
Zane Zell
Viann Zrubek

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The following selected documents have been used as source material for this Environmental Impact Statement (EIS).

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Bateman, A.F. and G.S. Yamamoto
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10.0

10.0 GLOSSARY OF TERMS AND ACRONYMS

10.1 Terms

Acre-Foot. The volume of water that covers 1 acre to a depth of 1 foot.

Active Fault. A fault on which movement has occurred during the past 10,000 years and which may be subject to recurring movement, usually indicated by small, periodic displacements or seismic activity.

Activity Day. A single occurrence of a recreation activity lasting for any period of time up to 12 hours; for example, one 8-hour fishing visit would count as 1 fishing activity day, as would a 2-hour visit.

Advisory Council on Historic Preservation. A 19-member body appointed, in part, by the President of the United States to advise the President and Congress and to coordinate the actions of federal agencies on matters relating to historic preservation, to comment on the effects of such actions on historic and archaeological cultural resources, and to perform other duties as required by law (Public Law 89-655; 16 USC 470).

Aerosolize. To form minute solid particles or liquid droplets of a substance by mechanical or chemical means (e.g., smoke, fire, or mist).

Aggregate. Any of several hard, inert materials (e.g., sand, gravel, or crushed stone) used for mixing with a cementing material to form concrete, mortar, or plaster, or used alone, as in railroad ballast or graded fill.

Air Installation Compatible Use Zone. A concept developed by the Air Force to promote land use development near its airfields in a manner that protects adjacent communities from noise and safety hazards associated with aircraft operations, and to preserve the operational integrity of the airfields.

Air Quality Region. An area based on jurisdictional boundaries, urban-industrial concentrations, and other factors including atmospheric areas, that is necessary to provide adequate implementation of air quality standards.

Alluvial Fan. The surface of a body of stream deposits that approximates a segment of a cone that spreads out downslope from the point where the stream leaves a mountainous area.

Alluvial/Colluvial Fan. A fan-shaped sedimentary deposit composed of materials eroded from a mountain range and deposited by a drainage issuing from a canyon mouth.

Alluvium. Sediments deposited by a stream or running water.

Alpha Particle. A product of the radioactive decay process which consists of a helium nucleus (two protons and two neutrons).

Ambient Air Quality Standards. Standards established on a state or federal level that define the limits for airborne concentrations of designated "criteria" pollutants (e.g., nitrogen dioxide, sulfur dioxide, carbon monoxide, total suspended particulates, ozone, lead, and hydrocarbons) to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards).

Ambient Noise. The existing noise characteristics of an area.

Ammonites. Flat, spiral fossil shells particularly abundant in the Mesozoic era.

Annual (plant). A plant that lives for only 1 year or season.

Anticline. A fold, convex upward, containing stratigraphically older rocks within its core.

Aquifer. The water-bearing portion of subsurface earth material that yields or is capable of yielding useful quantities of water to wells.

Arch. A broad, open anticlinal fold on a regional scale.

Archaeology. A scientific approach of the study of human ecology, cultural history, and cultural process, emphasizing systematic interpretation of material remains.

Archaic. A stage of prehistoric cultural development, recognized throughout North America, characterized by broad spectrum hunting and gathering economies and seasonal mobility. The material remains are recognized by the development of barbed and stemmed spear points, the extensive use of groundstone tools, and the lack of ceramics. The Archaic is also commonly used to designate a prehistoric period (generally 6000 B.C. to A.D. 500), but the dates vary from one region to another.

Argillaceous. Said of a rock or sediment composed of, or containing, clay-size particles or clay minerals.

Arterial. Signalized streets with signal spacings of 2 miles or less and turning movements at intersections that usually do not exceed 20 percent of total traffic. Urban arterials primarily serve through-traffic, and, as a secondary function, provide access to abutting properties (urban); roadways that provide large traffic volume capacity between major traffic generators, designed to facilitate traffic movement and discourage land access when feasible. Includes primary state roads (functional).

Artesian Well. A well penetrating a confined aquifer that is under sufficient pressure to cause the water to rise and flow from the well.

Articulated. Connected; in archaeology and paleontology, skeletal remains distributed in a way reflecting their relative positions in the living body.

Artifact. Anything that owes its shape, form, or placement to human activity. In archaeological studies, the term is applied to portable objects (e.g., tools and the byproducts of their manufacture).

Aseismic. An area or region not subject to earthquakes.

Assembly and Checkout. The process of final assembly and verification of a weapon system.

Assessed Valuation. In Montana, equal to the market valuation of property within a jurisdiction.

Assessment Ratio. Percentage of the market value of a property; used to calculate the taxable valuation against which mill rates are levied.

Atomic Number. The number of protons in the nucleus of a given chemical element equal to the positive charge of the nucleus.

Atomic Weight. The relative mass of the nucleus of a given chemical element in proportion to the mass of a hydrogen atom (one proton).

Attainment Area. An area that has been designated by the Environmental Protection Agency and the appropriate state air quality agency as having ambient air quality levels below the ceiling levels defined under the National Ambient Air Quality Standards.

Available Vacancy. A vacant housing unit that is either for sale or for rent.

Average Annual Daily Traffic. For a 1-year period, the total volume passing a point or segment of a highway facility in both directions, divided by the number of days in the year.

Average Cost Analysis. A method of determining the financial impacts associated with the construction of projects within a government jurisdiction utilizing ratios based on historical per capita expenditure patterns and revenue generation.

Baculites. An extinct form of ammonites with a rod-like shell.

Badlands. Intricately stream-dissected topography that is characterized by a very fine drainage network.

Base Flow. The lower, relatively nonvarying flow that tends to occur in a stream between rainfall-runoff events, often consisting of groundwater discharge to the stream.

Baseline. The existing and future-growth characterization of an area without the proposed program.

Basic Freeway Segment. A section of freeway facility on which operations are unaffected by weaving, diverging, or merging maneuvers.

Basin. A drainage or catchment area of a stream or lake.

Beachstrand Lines. Linear areas of low topographic relief that correspond to decreasing water levels around former glacial lakes.

Bedrock. Geologic formation or unit, generally solid, which underlies soil or other unconsolidated surficial deposits.

Bentonite. A soft, plastic, porous, light-colored rock composed essentially of clay minerals of the montmorillonite group and commonly able to absorb large quantities of water accompanied by an increase in volume.

Beta Particle. A product of the radioactive decay process that is physically identical to a high-velocity electron.

Biota. All of the organisms of an area; the flora and fauna of a region.

Bituminous Coal. The most abundant rank of coal, which ranks between sub-bituminous coal and anthracite in calorific value.

Body Wave. An earthquake wave that travels the interior of the earth.

Boomtown. A town where there is a rapid, widespread expansion of economic activity.

Bonds. Financial instruments used by government agencies to fund major capital improvement projects; typically either a general obligation bond or revenue bond.

Brachiopods. A phylum of invertebrates that has persisted from the Lower Cambrian to the present and consists of a marine animal with a calcareous bivalve shell with unequal valves.

Breaks. Terrain characterized by abrupt changes in surface slope (e.g., a line of cliffs and associated spurs and small ravines).

Bryozoans. A small phylum of aquatic animals that reproduce by budding, usually forming branching, mosslike colonies that are enclosed by a calcareous or ridged shell.

Budget. Document prepared by a government unit which estimates future revenues expected to be collected and the expenditure needs of the jurisdiction in a forthcoming fiscal year or years; includes estimates of potential revenues and expected expenditures by major fund groups (governmental funds, proprietary funds, and fiduciary fund types).

Butte. An isolated flat-topped hill or mountain which is formed as a remnant of extensive erosion of flat-lying rock.

Cairn. A distinctly artificial pile of rocks that may mark or enclose burials, vision quests, caches, or geodetic locales.

Cambrian. A period of the Paleozoic era extending from about 570 to 505 million years ago.

Campsite (Cultural Resources). A short-term habitation site containing evidence of daily living activities, as opposed to specialized activities (e.g., quarry site). Campsites are generally open-air occupations of perhaps weeks to months in duration.

Capacity (Transportation). The traffic-carrying ability of a facility while maintaining prescribed operational qualities (e.g., a specific level of service); the maximum amount of traffic that can be accommodated by a given facility. (Note: Traffic facilities generally operate poorly at or near capacity, and facilities are rarely designed or planned to operate within this range.)

Capacity (Utilities). The maximum load a system is capable of carrying under existing service conditions.

Capacity Analysis (Transportation). A set of procedures used to estimate the traffic-carrying ability of facilities within a defined range of operating conditions.

Capital Costs. Expenditures by local governments on physical infrastructure.

Capital Projects Fund. One of the governmental fund types, used to account for capital improvement projects other than those financed by proprietary funds or special assessment funds.

Carnivore. A flesh-eating animal.

Cenozoic. An era in geological history extending from the beginning of the Tertiary period, about 66 million years ago, to the present time, characterized by the rapid evolution of mammals, birds, grasses, shrubs, and higher flowering plants.

Ceramic Scatter. A spatially limited distribution of pot sherds on the ground surface.

Chronology. The science of arranging time in periods and ascertaining the dates and historical order of past events.

Climate. The prevalent or characteristic meteorological conditions (and their extremes) of any given location or region.

Clovis. The earliest, well documented period of man's occupation in the New World; generally dated at 11,000 B.C. and represented by large, well made, fluted points.

Collector Streets. Surface streets that provide land access and traffic circulation service within residential, commercial, and industrial areas (urban); secondary roads that provide access to higher-type roads, connect small communities and nearby areas, and serve adjacent property (functional).

Compact. A legal agreement among two or more states which has been ratified by the Congress.

Component. One location or element within a settlement/subsistence system. Archaeological sites may contain several components that reflect the use of the locality by different groups in different time periods.

Compound Fault. See Fault Zone.

Confined Aquifer. An aquifer that is overlain by an impermeable stratum within which water pressure may build up so that penetration by a well will result in a static water level that is considerably higher than the top of the aquifer.

Conjunctive Use. The integrated use of surface water and groundwater to maximize water availability in a given area.

Corridor. A strip of land of various widths described on both sides of a particular linear facility such as a highway or transmission line.

Coulee. A deep gulch or ravine; usually dry in summer.

Cretaceous. The last period of the Mesozoic era, extending between 144 and 65 million years ago.

Crinoids. A large class of fossil echinoderms that have a cup-shaped body, feathery arms, and a long, jointed stalk fixed to the base of the body to anchor the animal to the sea bottom.

Crystalline Rock. A rock consisting completely of crystals or fragments of crystals.

Culture. In general, the system of behavior, beliefs, institutions, and objects human beings use to relate to each other and to the environment.

Curation. The processes used to care for and preserve historically important artifacts, features, or structures.

Debt Service. A scheduled repayment of an amortized debt, usually resulting from the sale of bonds.

Debt Service Funds. One of the governmental funds used to account for annual payments required to pay back money which is borrowed by a governmental unit; generally limited to account for long-term debt from issuance of bonds.

Decibel. A logarithmic unit of measure of sound pressure level used to describe the loudness of sound. When used to correspond to the human range of hearing, decibels are weighted on an A-scale and expressed as dBA.

Decommissioning. The process of removing a weapon system from service.

Deflagration. A very intense, rapidly burning fire accompanied by the ejection of burning particles.

Deformation. A general term for the process of the folding, faulting, etc., of rocks, resulting from various earth forces.

Delay. Additional travel time experienced by a driver, passenger, or pedestrian beyond what would reasonably be desired for a given trip.

Demonstrated Reserves. An area containing 100-percent mineable resources which has been well defined as to areal extent and thickness based on the presence of active mining or production or through thorough geologic investigation.

Deployment. Strategic emplacement of a weapon system.

Deployment Area. Geographic region where missiles would be located.

Design Life. The anticipated functional life of a facility.

Designated Wilderness Area. A tract of land that has been granted congressional approval for incorporation into the National Wilderness Preservation System, as mandated by the Wilderness Act of 1964.

Developed. Said of land, a lot, a parcel, or an area that has been built upon, or where public services have been installed prior to residential or commercial construction.

Developed Recreation. Recreational use that occurs in areas where facilities are provided for concentrated public use (e.g., campgrounds, picnic areas, and swimming areas).

Dewatering. Cessation of the flow of a perennial stream resulting from man-induced actions such as agricultural diversions.

Direct Effects. Effects that are immediate consequences of program activities. In economics, the initial increase in employment and income resulting from program employment and material purchases before the indirect effects of these changes are measured.

Direct Employment. Military and civilian personnel who are employed by the Department of Defense and its contractors, and who are working onsite on the program.

Direct Expenditure. Expenditures of local governments directly related to the provision of goods or services.

Direct Impact. Effects resulting solely from program implementation.

Dispersed Recreation. Recreational use that occurs outside of developed sites.

Displacement. A general term for the relative movement of the two sides of a fault, measured in any direction.

Dissected Topography. An area of land characterized by numerous valleys and gullies created by extensive surface erosion.

Dissolved Oxygen. The concentration of molecular oxygen dissolved in water; a vital constituent for most aquatic animals.

District. National Register of Historic Places designation of a geographically defined area (urban or rural) possessing a significant concentration, linkage, or continuity of sites, structures, or objects united by past events (theme) or aesthetically by plan or physical development.

Disturbed Area. Specific land that has had its surface altered by grading, digging, or other construction-related activities.

Diversity. In biological literature, diversity usually refers to the number of species and their relative abundance in an area or habitat. Also referred to as species diversity.

Divide. The ridge marking the boundary between two adjacent drainage basins or dividing surface waters that flow naturally in one direction from those that flow in the opposite direction.

Dolomite. A variety of limestone or marble that is rich in magnesium carbonate.

Dome. Circular or elliptical hill or mountain sloping gently outward in all directions formed by a point or anticlinal uplift, or the eroded remnant of such a structure as indicated by geologic units which surround a central point or area and dip outward from that point.

DW. Serial correlation of error terms in a regression equation.

Earthquake. A sudden motion or trembling in the earth caused by the abrupt release of accumulated strain.

Econometrics. The application of economic theory and statistical procedures to observed data in order to (1) estimate the degree of influence of one variable on another and

(2) forecast endogenous variables from equations that quantify the interrelationships among the variables.

Economies of Scale. The decreases in an entity's long-run average costs that occur when it moves toward a specialization of resources, efficient utilization of equipment and manpower, and a lowering of units costs of inputs.

Ecotone. Transitional zone between two distinct ecological communities (e.g., grasslands to forest). Important because of the greater diversity provided by the presence of species from both communities.

Edentates. Mammals with few or no teeth including sloths, armadillos, and anteaters.

Effect. A change in an attribute. Effects can be caused by a variety of events, including those that result from program attributes acting on the resource attribute (direct effect); those that do not result directly from the action or from the attributes of other resources acting on the attribute being studied (indirect effect); those that result from attributes of other programs or other attributes that change because of other programs (cumulative effects); and those that result from natural causes (e.g., seasonal change).

Effluent. Wastewater discharge from a wastewater treatment facility.

Electromagnetic Radiation. Radiation produced by atomic or electrical activity. Its range of wavelengths or frequencies extends from very short gamma rays to the longest radio waves and includes visible light.

Electron. A particle of very small mass, carrying a unit negative or positive charge. The term electron, when used alone, commonly refers to negative electrons.

Electronic Spreadsheet. Computer software that allows the user to model simple relationships among parameters and produces a preformatted, tabular listing of the output.

Endangered Species. A species that is threatened with extinction throughout all or a significant portion of its range.

Energy. The capacity for doing work; taking a number of forms which may be transformed from one into another, such as thermal, mechanical, electrical, and chemical; in customary units, measured in kilowatt hours or British thermal units.

Enterprise Activity. Services provided or goods produced by a local government agency, generally self-supporting in terms of generating revenues that cover operating costs.

Enterprise Funds. In government finance, one of the proprietary fund types used to account for activities which are financed primarily through user charges.

Entitlement. A right to a fixed amount of water from a specific source.

Environmental Impact Analysis Process. The process of conducting environmental studies employed by the Air Force.

Eocene. An epoch of the Tertiary period extending from about 58 to 36 million years ago.

Ephemeral Stream. A stream that flows briefly only in response to precipitation in the immediate vicinity and whose channel is above the water table at all times.

Epicenter. The point on the earth's surface directly above the focus of an earthquake.

Equivalent Sound Level. The level of a constant sound which, in a given situation and time period, has the same sound energy as does a time-varying sound. Technically, equivalent sound level is the level of the time-weighted, mean square, A-weighted sound pressure. The time interval within which the measurement is taken should always be specified.

Escarpment. A long cliff or steep slope separating two comparatively level or more gently sloping surfaces; results from erosion or faulting.

Ethnography. The description of human groups and their behavior by direct observation and/or by transcription of statements by living persons.

Ethnohistory. History of nonliterate human groups consisting of oral, written, or ethnographic records.

Ethnology. A subdiscipline of anthropology that attempts to explain general patterns of human behavior by comparing ethnographic information on different living groups of people.

Eutrophication. The enrichment of a body of water with nutrients which in the presence of sunlight can stimulate the growth of algae and other aquatic plants that often cause undesirable effects.

Expenditure. A disbursement of funds by a government entity; includes operation and maintenance costs, as well as capital costs.

Explosive Safety Zone. The required safe distance between locations where explosive materials are stored or processed and other locations, such as inhabited buildings.

Extrapolation. The process of using known data or trends to predict unknown data or trends.

Fault. A fracture or zone of fractures along which there has been movement of the sides relative to one another and parallel to the fracture.

Fault Zone. A fault that is expressed as a zone of numerous small fractures.

Fauna. Animals; organisms of the animal kingdom of a given area taken collectively.

Feature. Nonportable portion of an archaeological site or structure (e.g., fire pit, wall, and area of artifact concentration).

Fiduciary Funds. One of the major fund groups, used to account for assets held by a jurisdiction in a trustee capacity, pension funds as an example.

Financial Statement. Document prepared by government unit which presents actual revenues received and expenditures made in the previous fiscal year; organized to present data along major fund groups (governmental, proprietary, and fiduciary fund types).

Firm Power. The amount of electrical power (in kilowatts) that a wholesaler is contractually bound to supply to a retailer on demand.

Fiscal Year. In government finance, the 12-month period which corresponds to the jurisdiction's accounting period, typically beginning July 1st and ending June 30th.

Flake. A small stone fragment produced as a byproduct of stone tool manufacturing; may also be used unmodified as a tool itself.

Flashpoint. The lowest temperature at which a liquid will give off flammable vapor in sufficient quantity to ignite when mixed with air and exposed to spark or flame.

Floodplain. The surface of relatively smooth land adjacent to a river channel that is covered by water when the river overflows.

Flora. Plants; organisms of the plant kingdom taken collectively.

Fluvial (Fluviatile). Of, or pertaining to, a river or rivers.

Fold. A curve or bend in rock strata.

Formation. A sequence of similar rock layers that can be traced over a large area.

Freeway. A multilane, divided highway with a minimum of two lanes for exclusive use of traffic in each direction, allowing full control of access and egress.

Frictional Unemployment. Unemployment attributable to time lost in changing jobs rather than to a lack of job oppportunities.

Fugitive Dust Emissions. Emissions released directly into the atmosphere that could not reasonably pass through a stack, chimney, vent, or other functionally equivalent opening.

Full-Scale Development. The stage of development of a weapon system when all components are built and tested at full scale.

Fund Balance. In government finance, the resultant cash balance of an account or group of accounts after actual expenditures made and revenues received have been debited or credited.

Furbearers. Mammalian species that are trapped or hunted for their pelts.

Gamma Radiation. A product of the radioactive decay process which includes very high-frequency electromagnetic waves.

Gastropods. A type of mollusk with a univalve shell (e.g., snail).

General Fund. One of the governmental fund types, used to account for all financial transactions and resources except those required to be accounted for in other funds. Typically supports governmental activities supported by local taxes; public safety, public health, and general administration functions, as examples. In school districts, accounts for all direct instructional costs.

General Obligation Bond. Financial instrument used by government agencies to fund major capital improvements; backed by full faith and credit of the issuing agency. Total amount of general obligation bond indebtedness is subject to statutory limitations, measured as percentage of jurisdiction's tax base. Used primarily for general purpose projects (administrative facility construction, parkland acquisition, and law enforcement and fire protection facility construction, as examples) which do not lend themselves to revenue bond financing.

Geologic Hazard. A naturally occurring or manmade geologic condition or phenomenon that presents a risk or is a potential danger to life and property.

Geologic Unit. A geologic formation, group, or member.

Geomorphology. That branch of geology specializing in the origin, development, and characteristics of surface features of the earth.

Geophysical Anomaly. A geologic feature, commonly subsurface, identified by geophysical techniques, which is different than its surroundings.

Glacial. Of or relating to the movement of continental or alpine ice sheets formed by the compaction and recrystallization of snow.

Glacial Lake. Lake derived from meltwater off a glacier commonly formed when an ice sheet dams a natural drainageway.

Glacial Till. Unsorted, generally unconsolidated, nonstratified coarse sediments deposited beneath a glacier which were not reworked by meltwater.

Governmental Funds. One of the major fund groups, consisting of the general fund, special revenue funds, capital projects funds, debt service funds, and special assessment funds; as differentiated from proprietary funds (enterprise and internal service funds) and fiduciary funds (trust and pension fund accounts); accounts for almost all of the financial transactions of a jurisdiction.

Granite. A broadly used term for a quartz-bearing, coarse, crystalline igneous rock formed deep beneath the earth's surface.

Grassland Biome. Major ecological community of plants and animals (e.g., grassland and tropical rain forest).

Gravity Lineament. A linear feature, commonly subsurface, identified by a difference in the gravitational field over an area which in some cases may represent a subsurface fault.

Gravity Model. A system of equations that allocates population on the basis of community size and its proximity to a worksite.

Gross Labor-Force Participation Rate. The ratio of employment plus unemployment to total population.

Groundstone Artifacts. Stone artifacts made by grinding rather than flaking (e.g., milling stones and mortar and pestle).

Group. Two or more associated geological formations.

Hadrosaur. _Maiasaura peeblesorum_; vegetarian, duckbilled dinosaur.

Half Life. The time required for disintegration or transformation of half of the atoms of a radioactive substance.

Hard Mobile Launcher. Special vehicles, hardened against nuclear attack, which will be used to transport and launch the Small Intercontinental Ballistic Missiles.

Hazardous Waste. Any waste that poses a substantial present or potential hazard to human health or living organisms because such wastes are nondegradable or persistent in nature, because they can be biologically magnified, because they can be lethal, or because they may otherwise cause or tend to cause detrimental cumulative effects.

Hearth/Firepit. A feature used for the placement of fires; may be lined with clay or stones.

Heavy Vehicles. Any vehicles with more than four tires touching the pavement; includes trucks, recreational vehicles, and buses.

Herbaceous (plant). Plant without persistent woody stems.

Herpetofauna. Amphibians (e.g., frogs, salamanders, and turtles) and reptiles (e.g., lizards and snakes).

High-Density Wintering Habitat. Areas where large numbers of big game species congregate during the winter months. (See Severe Wintering Habitat.)

Historic. A period of time after the advent of written history. In the Region of Influence, the historic period ranges from about A.D. 1800 to the present. It also refers to items primarily of Euroamerican manufacture.

Holocene. The time since the end of the Pleistocene epoch, characterized by the absence of large continental or Cordilleran ice sheets and the extinction of large mammalian life-forms. Generally considered to be the last 10,000 years.

Household Size. The average number of individuals residing in a single dwelling unit.

Hydraulic Capacity. The flow rate that can be delivered by a water-supply system at a specified water pressure under continuously saturated system conditions (i.e., under a continuous demand from all outlets of the distribution system).

Hydrology. The science dealing with the properties, distribution, and circulation of water on the surface of the land and in the soil and underlying rocks.

Hypothetical Reserves. Hypothetical reserves are those that have been calculated based on limited field observations, limited air-photograph analysis and satellite interpretations, and published data on the areal extent and thickness of geologically similar units.

Hypsilophodont. A small, agile, bipedal dinosaur of the order Ornithopoda.

Igneous Rock. One of the three basic rock classes, the term refers to any rock formed by the solidification of molten or partly molten material. Igneous rocks formed by solidification at the surface are termed extrusive or volcanic while those formed below the surface are termed intrusive.

Impact. An assessment of the meaning of changes in all attributes being studied for a given resource; an aggregation of all the adverse effects, usually measured using a qualitative and nominally subjective technique.

Impoundment. A manmade area for the purpose of detention or retention of surface water.

Incised. Said of a stream channel that has been downcut or entrenched into the land surface during, and because of, a stream's rejuvenation.

Indirect Employment. Employment resulting from the purchases of workers who are directly working on a specified program. Also includes any subsequent employment arising from the increase in purchases in the area.

Indirect Impacts. Program-related impacts (usually population changes and resulting impacts) not directly attributable to the program itself. For example, direct program employees will spend some of their income locally. As a result, local industries will tend to hire more workers as they expand in response to the increased demand. This additional employment is termed an "indirect impact."

Induced Seismic Activity. A seismic activity that is initiated or increased as a result of nontectonic processes (i.e., fluid injection or withdrawal, or reservoir loading).

Inferred Source. Resources that have been defined as to areal extent and thickness based on the presence of active mining or production or geologic investigation of which 15 percent is considered unmineable due to deficiencies in quality or uncertainties in field observations.

Infiltration. The leakage of groundwater into a sewer from defective or deteriorating pipe joints.

Inflow. The entrance of stormwater runoff into a sanitary sewer through defective or deteriorating manhole structures or via the illicit connection of roof drains or street storm drains to sanitary sewers.

Infrastructure. The system of public utility lines, communication facility networks, and roadways that connect all the structures and facilities in a given locale.

Initial Operational Capability. The point when the first ten missiles of the Small Intercontinental Ballistic Missile system will be operational.

Injection Well. A well in which a fluid is forced into the ground under pressure, commonly used as a technique for secondary recovery of oil and gas (e.g., forcing steam into one well to assist oil or gas recovery at an adjacent well).

Inmigrants. All persons relocating to a defined geographic area as a result of the proposed program, usually calculated on an annual basis.

Input-Output Model. Method of estimating the interrelationship and the flow of goods and services among industrial sections of the economy. Used to estimate the secondary (indirect and induced) economic effects of an initial change in a specific economic sector.

Insectivores. Any order of mammals depending on insects for food (e.g., moles, shrews, and hedgehogs).

Intercontinental Ballistic Missile. A land-based missile capable of accurate delivery over intercontinental ranges, usually greater than 5,000 miles.

Intermittent Stream. A stream that does not flow continuously during all periods of the year.

Internal Service Funds. One of the proprietary funds, used to account for the financing of goods or services provided by one department or agency to other departments or agencies of the jurisdiction on a cost reimbursement basis; photocopying, typing, and publishing services as examples.

Interstate. The designated National System of Interstate and Defense Highways located in both rural and urban areas; they connect the East and West coasts and extend from Canadian border points to various points on the Mexican border.

Irradiation. Exposure to radiation.

Isolated Artifact. An artifact, or a small, disarticulated group of artifacts, that cannot be associated with, or is situated outside of, a cultural resource site.

Isotopes. Different forms of the same chemical element which have identical atomic numbers but different atomic weights.

Jackson Turbidity Unit. A visual measurement of the turbidity of water. The method involves the extinction of candlelight through a column of water resulting from particles suspended in the water.

Jurassic. A period of the Mesozoic era extending from about 208 to 144 million years ago.

K-Factor. A measure of the resistance of the soil surface to erosion, based upon its physical and chemical properties.

Kame. A short ridge or mound of stratified drift deposited by glacial meltwater.

Kill Site. An archaeological site indicated by the presence or association of faunal remains, butchering tools, and hunting equipment (e.g., projectile points).

Kilowatt. A unit of power equivalent to 1,000 watts.

Lacustrine. Pertaining to, produced by, or formed in a lake or lakes; growing in or inhabiting lakes. Characterized by lakes or lakebeds.

Land Use Plans and Policies. Guidelines adopted by governments to direct future land use within their jurisdictions.

Landslide. The downslope movement of soil and rock material (en masse) under gravitational influence.

L_{dn} **Noise Level.** The 24-hour average-energy sound level expressed in decibels, with a 10-decibel penalty added to sound levels between 10:00 P.M. and 7:00 A.M.

Leachate. A solution containing material removed by a liquid, e.g., by water that percolates through soil or rock.

L_{eq} **Noise Level.** A constant amount of acoustic energy equivalent to the energy contained in the time-varying noise measured from a given source for a given time.

Level of Impact. The measure of the magnitude of an impact. For each environmental resource in this study, specific definitions have been given for negligible, low, moderate, and high impact levels.

Level of Service. A qualitative measure describing operational conditions within a traffic stream and how they are perceived by motorists and/or passengers.

Level Terrain. Any combination of grades and horizontal and vertical alignment permitting heavy vehicles to maintain approximately the same speed as passenger cars; this generally includes short grades of no more than 1 to 2 percent.

Limb. The sides of a fold.

Limestone. A sedimentary rock consisting chiefly of calcium carbonate.

Lineament. Any linear, topographic feature such as an aligned stream channel or faultline which may represent crustal features.

Linear Energy Transfer. The rate that a charged particle deposits its energy per unit path length.

Lithic Scatter. An archaeological site consisting only of stone artifacts.

Lithology. The physical character of a rock (e.g., its color, hardness, mineral composition, and grain size).

Load. The amount of electric power or natural gas required of a system at a given point.

Loam. A rich permeable soil composed of equal amounts of clay, silt, and sand, usually containing organic matter.

Locality. A particular spot within a geologic unit from which a specimen is obtained or may be found; usually a location of dense or well preserved fossils.

Locus/Loci. A place or locality; used archaeologically to define a small area within a larger site.

Loess. A typically buff-colored, windblown silt directly attributable to glacial outwash.

Low Flow. The minimum discharge of a stream maintained for a given duration over a specified period of time (e.g., the 7-day, 10-year low flow).

m_b. Body wave magnitude. An earthquake magnitude determined at large distances by using the logarithm of the ratio of amplitude to period of body waves.

M_L. Local Richter earthquake magnitude. A measure of the strain of energy released by an earthquake within 100 kilometers of the epicenter.

Mafic Intrusive. A generally dark-colored igneous rock formed chiefly of minerals with high iron or magnesium content.

Magnetic Lineament. A linear feature, commonly subsurface, identified by a difference in the magnetic field over an area which in some cases may represent a subsurface fault.

Magnitude (earthquake). A measure of the strength of an earthquake or the strain energy it releases.

Mammoth/Mastodon. Extinct elephants from the Pleistocene epoch.

Mass Fraction. The relative proportion, by weight, of a specific isotope present in a particular element.

Mass Movement. Any downward movement of soil or rock under the force of gravity including soil creep, rockfalls, and landslides.

Maximum Credible Earthquake. The largest earthquake capable of being produced from a source, structure, or region under the currently known tectonic framework.

Mean. A value that is computed by dividing the sum of a set of terms by the number of terms (i.e., average).

Median. The midpoint of a distribution.

Medicine Wheel. Large stone circle with rock alignments radiating from the center to the circle edge, most likely ceremonial features.

Megafauna. Various species of large mammals that became extinct in North America sometime before 6,000 years before present. These mammals include the mammoth, giant bison, camel, and giant sloth.

Megawatt. 1,000 kilowatts or 1 million watts.

Mesotrophic. A body of water with moderate amounts of plant nutrients with resulting medium primary productivity, and usually having moderate levels of dissolved oxygen.

Mesozoic. An era in geological history, ranging from about 245 to 66 million years ago, characterized by the development of reptiles.

Metamorphic Rock. A rock derived from preexisting rocks because of changes resulting from increased temperature and pressure and the chemical environment, generally deep in the earth's crust.

Meteorology. The scientific study of the atmosphere.

Microgram. One-millionth of a gram.

Midden. Soil horizon resulting from the accumulation of human living debris containing artifacts and cultural refuse (e.g., bone and shell fragments, fire-cracked rocks, charcoal, chipping detritus, stone tools, or organic residues).

Milligram. One-thousandth of a gram.

Milling Station. An area within an archaeological site used for milling seeds or corn; may consist of portable milling stones or may be nonportable milling places in naturally occurring bedrock.

Millirad. One one-thousandth of a rad (a unit of radiation, see Rad).

Miocene. An epoch of the Tertiary period, 24 to 5 million years ago, marked by the development of apes and the appearance of ancestral gibbons.

Mitigation. A method to reduce or eliminate adverse program impacts (e.g., avoidance of sites, fencing, or excavation if no other alternative is possible).

Mobile Home. A housing unit designed as a permanent dwelling, usually connected to utilities, but designed without a permanent foundation.

Modified Mercalli Intensity. An arbitrary measure of an earthquake's intensity based on its effect on people and structures. Ranges from I (not felt by people) to XII (almost total damage).

Mollusca. A large phylum of invertebrate animals with soft bodies protected by a calcareous shell (e.g., snails, mussels, bivalves, and octopus).

Most Probable Number An estimate of the density of coliform bacteria in a water sample based on certain probability formulas applied to standard dilutions of the sample.

Mountainous Terrain. Any combination of grades and horizontal and vertical alignments causing heavy vehicles to operate at crawl speeds for significant distances or at frequent intervals.

Multifamily Housing. Renter-occupied units; includes apartments, duplexes, and fourplexes.

Multilane Highway. A highway with at least two lanes for the exclusive use of traffic in each direction, with no or partial control of access, that may have periodic interruptions to flow at signalized intersections.

Multiple Resource Area. All, or a defined portion of, the cultural resources identified within a specific geographic area that have been identified for inclusion in the National Register of Historic Places.

Multiplier. In economics, used to determine the indirect and induced effects (in terms of increased employment, income, or output) resulting from program activities.

National Landmark (Historic). A site, building, or object in private or public ownership that possesses national significance in American history, archaeology, or culture. In order to achieve landmark status, a property must be, or have the clear potential to be recognized, understood, and appreciated publicly and professionally for the strength and

clarity of its historical association, its architectural or design excellence, or its extraordinary information content on a national scale.

National Register of Historic Places. A register of districts, sites, buildings, structures, and objects important in American history, architecture, archaeology, and culture, maintained by the Secretary of the Interior under authority of Section 2(b) of the Historic Sites Act of 1935 and Section 101(a)(1) of the National Historic Preservation Act of 1966.

National Wildlife Refuge. Lands set aside for their wildlife habitat values and managed by the U.S. Fish and Wildlife Service for the conservation or enhancement of waterfowl, big game, endangered species, and nongame species populations.

Native Americans. Used in a collective sense to refer to all natives of North America; usually excludes Eskimos and Aleuts.

Neighborhood Schools. In the Great Falls Public Schools, students attend the elementary school within walking distance from their homes, unless they live more than 1 mile from the closest school, in which case they are bused.

Nephelometric Turbidity Unit. An instrument-based measurement of the turbidity of water. This method involves inducing a light beam through a water sample and determining how much light is scattered by the turbidity.

Net Equivalent Weight. The amount of TNT required to produce an explosive power equal to that of the component of interest.

Neutron. An electrically neutral atomic particle found in the nuclei of all elements except those of ordinary (light) hydrogen.

Noise Exposure. The cumulative acoustic stimulation reaching the ear over a specified period of time (e.g., a work shift, a day, a working life, or a lifetime).

Noise Sensitive Areas. Specific locations (or general areas) of types of land use activities (e.g., schools and hospitals) that may be affected by traffic noise.

Nonattainment Area. An area that has been designated by the Environmental Protection Agency and the appropriate state air quality agency as exceeding one or more National Ambient Air Quality Standards.

Noncompliance. Action contradicting a specified procedure or causing results outside specified limits.

Nonfirm Power. Electric power supplied under a contract that makes seasonal excess power available (i.e., power in excess of contractually firm power) and is generally sold at a lower price than firm power. This type of contract may be offered by a generator with a large hydroelectric capacity that is subject to water shortages during periods of low precipitation.

Nontax Revenue. Revenue of local governments from all other sources other than taxes; includes charges for services, fines, fees, intergovernmental transfers, income from enterprise activities, and other miscellaneous sources.

Normal Fault. A fault where the overlying side of the fault appears to have moved downward relative to the underlying side of the fault.

Nuclei. Small particles around which a chemical substance may collect, e.g., a dust particle around which a raindrop forms.

Nucleus. The small positively charged central region of an atom, which comprises essentially all the mass of the atom.

Oligocene. An epoch of the Tertiary period extending from about 36 to 24 million years ago.

Operations Activities. Those activities required to maintain the Small Intercontinental Ballistic Missile system in a secure, survivable, launch-ready condition.

Operation and Maintenance Costs. Noncapital costs incurred in providing local government services; includes all direct expenditures, as well as items such as debt service and payments to retirement systems.

Orogeny. The process that forms mountains.

Overall Vacancy. Total number of single-family, multifamily, or mobile homes that are not occupied at any given time.

Overdraft. A condition in which groundwater withdrawals exceed the amount of recharge.

Overview. A report that summarizes and generalizes information, usually of a region.

Paleo-. Prefix meaning "old" or "ancient."

Paleontological Resources. Fossilized organic remains from past geological periods.

Paleozoic. An era in geological history occurring between 570 and 245 million years ago, marked by the culmination of almost all invertebrates except the insects; in its later periods, marked by the first appearance of land plants, amphibians, and reptiles.

Part I Offense. Crimes of violence including homicide, rape, robbery, and aggravated assault. Crimes against property including burglary, larceny/theft, and motor vehicle theft.

Part II Offense. Serious crimes not reported as part of the seven major Part I crimes, including negligent manslaughter, other assaults, arson, forgery and counterfeiting, fraud, embezzlement, stolen property offenses, vandalism, weapons offenses, prostitution, sex offenses, narcotic drug offenses, gambling, and offenses against the family.

Part III Offense. Lesser offenses that are not as serious as Part I or Part II offenses.

Particle Density. The number of particles per unit volume.

Passenger Car Equivalent. The number of passenger cars that are displaced by a single heavy vehicle of a particular type under prevailing roadway, traffic, and control conditions.

Peak Demand. The highest instantaneous amount of electrical power (in kilowatts) that an electrical system is required to supply over a given time frame, usually 1 year.

Peak Hour. The hour of highest traffic volume on a given section of roadway between 7 and 9 A.M. or between 4 and 6 P.M.

Peak-Hour Factor. The ratio of total hourly volume to the maximum 15-minute rate of flow within the hour.

Peak Year. The year when a particular program-related effect (e.g., total employment) is greatest.

Pelecypods. A class of bivalve mollusks with bilaterally symmetrical shells.

Pennsylvanian. A period of the Paleozoic era extending from about 320 to 286 million years ago.

Per Capita Expenditures. Amount of expenditures in a given category calculated on a per person basis.

Per Capita Personal Income. Annual income per person.

Per Capita Revenues. Amount of revenues in a given category calculated on a per person basis.

Perennial (plant). A plant that lives for several years or more.

Perennial Stream. A stream that flows continuously throughout the year.

Permanent Housing. Units intended for year-round use.

Permanently Disturbed. Surfaces that will be covered by impervious materials or kept in a cleared condition to accommodate buildings, parking lots, roads, and security zones.

Permeability. The property or capacity of a porous rock, sediment, or soil for transmitting a fluid.

Permian. The most recent geologic period of the Paleozoic era dating to 230 million years ago.

Personal Income. Current income received by persons from all sources; includes transfer payments from governments or businesses.

Petroglyph. Schematic or representational art incised or pecked into a rock surface.

Petroliferous. Said of a geologic rock unit containing oil and/or gas.

pH. An indication of the acidity of a solution defined as log (1/[H]), where [H] denotes the concentration of hydrogen ions in the solution.

Phreatophytes. Plants whose roots reach down to the capillary fringe of the groundwater table; often found in riparian zones.

Physiographic Province. A region with similar geologic structures and climate that has a unified geomorphic history.

Physiography. A description of the surface features of the earth.

Pictograph. Schematic or representational art painted or drawn onto a rock surface.

Plasticiser. A chemical agent that is added to make a material more flexible.

Pleistocene. The last 1.6 million years of geological history, marked by repeated glaciation and the first indication of social life in human beings.

Pliocene. An epoch of the Tertiary period extending from about 5 to 1.6 million years ago.

Plunge. The inclination of a fold axis or other linear structure, measured on the vertical plane.

Porosity. The percentage of the bulk volume of a rock or soil occupied by pore spaces (interstices).

Post Boost Vehicle. The portion of the missile containing the reentry vehicle and the guidance and attitude control system.

Postulate. To propose an explanation for a given process or event.

Potentiometric Level. The level to which groundwater would rise under unconfined conditions; it may assume values higher than the local topography.

Prairie Pothole. A wetland formed by previous glacial activity.

Precambrian. All geologic time before the beginning of the Paleozoic era, equivalent to about 90 percent of geologic time.

Predictive Model. In archaeology, a statement of the relationships among known sites and between sites and the environment that is used to predict the location, density, and types of sites in areas not yet surveyed.

Prehistoric. The period of time before the written record, generally before A.D. 1800 in western North America.

Preliminary Treatment. The first processes at a wastewater treatment facility to remove coarse debris from the wastewater. Typically, the treatment involves bar or mechanical screening, grit removal, and sometimes comminution.

Prevention of Significant Deterioration Area. An area where air quality is regulated in order to maintain air quality standards. It also regulates the amount of allowable deterioration. Land areas are designated as:

- Class I -- An air quality area where the annual total suspended particulate value may only increase by 5 milligrams per cubic meter;

- Class II -- An air quality area where an annual increase in total suspended particulate value of 19 milligrams per cubic meter is allowed; and

- Class III -- An air quality area where an annual increase in total suspended particulate value of 37 milligrams per cubic meter is allowed.

Primary Road. A consolidated system of connected main roads important to regional, interstate, and statewide travel; they consist of rural arterial routes and their extensions into and through urban areas of 5,000 or more population.

Prime Farmland. Land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary of Agriculture (Farmland Protection Policy Act, 7 CFR 658).

Principal Aquifer. An aquifer that supplies the majority of the groundwater used in a given region.

Probability Analysis. An analysis conducted to evaluate the chance of a given event's occurrence.

Projectile Point. Implement that probably served as the tip of a dart, lance, spear, or arrow.

Property Tax. Tax imposed by local governments based on the value of property within their jurisdiction.

Proposed Wilderness Area. An area under consideration for designation as a wilderness area under the Wilderness Act of 1964 (Public Law 88-577).

Proprietary Funds. One of the major fund groups, consisting of enterprise fund accounts and internal service fund accounts.

Protohistory. The period when nonliterate American Indian cultures were affected by Euroamericans without direct contact. For instance, inland Indian tribes received trade goods and reports of European cultures from coastal tribes before the arrival of European explorers in the interior.

Proton. A positively charged atomic particle physically identical with the nucleus of the ordinary (light) hydrogen atom. All atomic nuclei contain protons.

Provenience. The place where something is produced or found; the location of a fossil or artifact.

Public Domain Land. Any land or interest in land owned by the United States and administered by the Secretary of the Interior through the Bureau of Land Management.

Public Finance. Finances of, or relating to, a government entity.

Quarry (Cultural Resources). A locality where lithic material was extracted and initially prepared for the manufacture of stone implements. In the narrow sense, the term refers to places where raw materials were actually excavated, but its use is commonly extended to localities where materials are collected at the surface (e.g., gravel deposits).

Quaternary. A geologic period including the Pleistocene and Holocene epochs; the last 1.6 million years.

Quartzite. A metamorphic rock formed by the recrystallization of sandstone or chert by heat or pressure.

Rad. A unit of absorbed dose of radiation that represents the absorption of 100 ergs of ionizing radiation per gram of absorbing material (e.g., body tissue).

Radioactivity. The spontaneous emission of energy from an unstable atomic nucleus in the form of alpha or beta particles and gamma radiation.

Radiobiological Research. The study of the effects of radiation on living organisms.

Radiocarbon Dating. A method of dating carbon-bearing samples by analysis of radioactive carbon (C-14) content.

Radiometric Dating. Calculating an age in years for geologic materials by measuring the presence of a short-life radioactive element.

Rangeland. Land devoted to the maintenance (grazing and keeping) of animals (e.g., cattle, sheep, and horses).

Raptors. Those species of birds (e.g., hawks, eagles, falcons, and owls) that are considered birds of prey.

Recharge. The process by which water is absorbed and added to the zone of saturation either directly into a formation, or indirectly by way of another formation.

Reclamation. The process of restoring an area that has been disturbed, or the treatment to restore continued utility of a waste substance.

Recreation Standard. The standard used to predict future recreation needs based on population.

Recreational Vehicle. A heavy vehicle operated by a private motorist and involved in the transport of recreational equipment or facilities.

Region of Influence. That area where program-induced effects of any magnitude may be expected to occur.

Regular A Students. Where more than 3 percent but less than 20 percent of the school district's membership live and whose parents work on federal property in order to qualify for Public Law 81-874 entitlements.

Regular B Students. Where more than 3 percent but less than 20 percent of the school district's membership have parents who work on federal property in order to qualify for Public Law 81-874 entitlements.

Relief. The vertical difference in elevation between the hilltops or mountain summits and the lowlands or valleys of a given region.

Research Natural Area. An area designated by its managing agency (usually a federal agency) to be maintained in its natural state for research.

Reserve Bonding Capacity. Statutory limit of long-term debt of a jurisdiction minus current outstanding debt.

Reserve Margin. The difference between the net system generating capability and maximum system load requirements.

Revegetation. Regrowth or replacement of a plant community on a disturbed site. Revegetation may be assisted by site preparation, planting, and treatment, or it may occur naturally.

Revenue. The yield of sources of income that a government entity collects or receives.

Revenue Bond. Financial instrument used by government agencies to fund major capital improvements. Used for projects which generate revenue from user charges or similar fees or charges which are applied towards both project operation and debt retirement (water and sewer plant operations, as examples).

Reverse Fault. Opposite of a normal fault (i.e., the overlying side of the fault appears to have moved upward relative to its underlying side).

Rights-of-Way. Strips of land that powerlines, pipelines, access roads, or maintenance roads pass through or over.

Rill Erosion. Erosion along numerous, closely spaced channels. Intermediate between sheet and gully erosion.

Riparian. An area (and associated habitat, vegetation, and species) near the edge of water bodies (e.g., streams and lakes).

Rockshelter. A naturally formed sheltered overhang that was commonly inhabited by prehistoric groups; it is generally found on a vertical rock face and is not as deep as a cave.

Rolling Terrain. Any combination of grades and horizontal and vertical alignments causing heavy vehicles to reduce their speeds substantially below those of passenger cars, but not causing them to operate at crawl speeds for any significant length of time.

Runoff. The noninfiltrating water entering a stream or other conveyance channel shortly after a rainfall event.

Rural Area. The area outside towns, cities, or communities that is characterized by very low-density housing concentrations, agricultural land uses, and a general lack of most public services.

Rural Electric Cooperative. Cooperative sponsored by the Rural Electrification Administration of the U.S. Department of Agriculture to supply electricity to a rural area.

Saline Seep. An area where saline, shallow groundwater reaches the ground surface, precipitating salts and rendering the soil unfit for agricultural production.

Sampling. The selection of a portion of a study area or population, the analysis of which is intended to permit generalization about the entire population. In archaeology, samples are often used to reduce the amount of land area covered in a survey or the number of artifacts analyzed from a site. Statistical sampling is generally preferred since it is possible to specify the bias or probability of error in the results, but judgmental or intuitive samples are sometimes used.

Sandstone. A clastic sedimentary rock composed of sand-size particles in a fine-grained matrix and held firmly in place by a cementing material; the consolidated equivalent of sand.

Savannah. A grassland with scattered trees.

Scenic Highways. Highways or sections of highways that have been identified and/or designated as scenic passageways by state and/or federal agencies or by commercial road atlases.

Scrub (Scrubland). Land dominated by sclerophyll or microphyll shrubs and/or multistemmed trees, generally not exceeding 10 meters.

Seasonality. Phenomena that show cyclic or repeated behavior according to the season.

Secondary. Rural major collector routes that carry extensive local traffic.

Secondary Employment. In economics, the additional employment and income generated by the economic activity required to produce the inputs to meet the initial material requirements. The term often is used to include induced effects.

Secondary Recovery (Oil and Gas). A process that allows greater production from oil and gas wells by artificially augmenting the reservoir energy (e.g., injection wells).

Secondary Treatment. Wastewater treatment, beyond primary treatment, in which bacteria consume the organic parts of waste. This biochemical action is usually accomplished by the use of trickling filters or the activated sludge process.

Section 6 School. Under Public Law 81-874, a school building constructed on federal land.

Section 7 Consultation. Under Section 7(a) of the Endangered Species Act, each agency must first consult with the affected state and then with the Secretary of the Interior to ascertain the impact of its proposed actions on any endangered or threatened species.

Security Zones. Designated protected areas around a facility or site.

Sediment. Solid fragmental material that originates from weather-beaten rocks and is transported or deposited by air, water, or ice.

Sedimentary Rock. A rock resulting from the consolidation of loose sediment that has accumulated in layers.

Seismic. Pertaining to an earthquake or to earth vibrations; includes those that are artificially induced.

Seismic Source Zone. A zone determined by tectonics, historic seismicity, or both; it is believed to be capable of generating earthquakes.

Seismicity. The occurrence of earth movements in the form of earthquakes or ground shaking.

Seismotectonic Province. A region characterized by similar tectonic and seismic characteristics.

Sensitive Noise Receptors. See Noise Sensitive Areas.

Severe Wintering Habitat. Areas where big game congregate during the most severe winter months. (See High Density Wintering Habitat.)

Shale. A fine-grained sedimentary rock formed by the consolidation of clay, silt, and mud.

Sheet Erosion. Erosion caused by a layer of water moving downward on a surface that has not yet developed channels. Uneven sheet erosion leads to the formation of rills, and finally gullies.

Significance. The importance of an impact on a resource. Council on Environmental Quality regulations specify several tests to determine whether an action will significantly affect the quality of the human environment. While these tests apply to the entire action, they can also be used in an amended form to judge impact significance for individual resources. It is important to note that a high impact may not be significant, while a low impact may be significant. Significance is an either/or determination. The level of impact described is either significant or not significant. Additionally, beneficial significance must be determined at the same level as adverse significance. As specified in the Council on Environmental Quality regulations, significance needs to be determined for each of the three geographic areas: local, regional, and national. This places the impact into context. Significance is also determined in terms of intensity.

Siltstone. A fine-grained sedimentary rock, primarily composed of silt-sized particles.

Single-Family Housing. A detached dwelling unit designed to provide living quarters for one family.

Site. Any location where humans have altered the terrain.

Site-Specific. A study of the geographic program area which is identified at the second tier of the Environmental Impact Analysis Process.

Slag. A rock-like residue that is created after iron or other material is subjected to an intense fire.

Sloughs. Depressions that collect water.

Soil. A natural body consisting of layers or horizons of mineral and/or organic constituents of variable thickness and differing from the parent material in their morphological, physical, chemical, and mineralogical properties, and biological characteristics.

Soil Profile. A vertical section of a soil that displays all its horizons including the original rock.

Sound Level. The quantity in decibels measured by a sound level meter satisfying the requirements of American National Standards Specification for Sound Level Meters S1.4-1971. Sound level is the frequency-weighted sound pressure level obtained with the standardized dynamic characteristic "fast" or "slow" and weighting A, B, or C; unless otherwise indicated, the A-weighted is used. The unit of any sound level is the decibel, which has the unit symbol dB.

Special Assessment Funds. One of the governmental fund types, used to account for financing of public improvements or services deemed to benefit the properties against which special assessments are levied (a charge for sidewalk construction, as an example, based upon the linear footage of property frontage and a cost per linear foot for sidewalk construction).

Special District. Local government unit charged with provision of a specific service. Examples include water supply districts, lighting districts, and flood control districts. Generally, funding is from property taxes levied on the property benefiting from the service.

Special Revenue Funds. Used to account for the proceeds of special revenue sources (redistributed state-shared revenues such as gasoline taxes) that are legally restricted to expenditures for specific purposes (road construction as an example); also supported in part by local property taxes.

Species Diversity. See Diversity.

Standard Industrial Classification. A federal scheme classifying industries by major lines of business grouped into categories of similar activity.

State Historic Preservation Officer. The official within each state, authorized by the state at the request of the Secretary of the Interior, to act as liaison for purposes of implementing the National Historic Preservation Act.

Statistical Techniques. Analyses that produce estimates of a dependent variable given specific values of one or more independent variables.

Storage (Groundwater). The total volume of groundwater contained within an aquifer or groundwater basin. In several states, the term refers to the "economically" recoverable volume of water from a groundwater basin.

Stratified Site. An archaeological site exhibiting various strata or layers of occupation; usually implies a large site with a long occupation.

Stratigraphic Column. A composite diagram that shows the subdivisions of part or all of geologic time and the sequence of stratigraphic units of a given locality or region.

Stratigraphic Sequence. A chronologic succession of sedimentary rocks from older below to younger above, essentially without interruption.

Stratigraphic Unit. A stratum or body of adjacent strata recognized as a unit in the classification of a rock sequence; used for any purpose (e.g., description, mapping, and correlation).

Stratigraphy. The interpretation and analysis of geologic strata; concerned with the original succession and age relations of layered materials and their individual properties (i.e., cultural materials are dated relative to each other by their position in stratigraphic layers).

Structural Geology. The branch of geology that deals with the form, arrangement, and internal structure of rocks.

Sub-Bituminous Coal. A black coal, intermediate in rank between lignite and bituminous coal and distinguished from lignite by a higher carbon and lower moisture content.

Subsistence/Settlement Pattern. The distributional patterns of site types in relation to the environment that reflect a particular adaptation. Aspects of land use include the function, duration, and seasonality of individual sites.

Successional Communities. A stage or recognizable condition of a plant community that occurs during its development from bare ground to climax.

Super A Students. Where 20 percent or more of the school district's membership live and whose parents work on federal property which qualifies the district for Public Law 81-874 entitlements.

Super B Students. Where 20 percent or more of the school district's membership have parents who work on federal property which qualifies the district for Public Law 81-874 entitlements.

Surface Collection. Systematic mapping and removal of artifacts from a site by means not involving excavation.

Survey. A systematic search for cultural resources; may include literature review and records search, but an on-ground field investigation is usually implied. Surveys may be conducted at different levels of intensity, ranging from a reconnaissance or spot check to an intensive inventory study.

Syncline. A fold, concave upward, containing stratigraphically younger rocks within its core.

Tax Revenue. Revenue of local governments, generally based on the valuation of goods or services; includes property, sales, excise, and other miscellaneous taxes.

Taxable Valuation. Value of property after assessment ratios are applied.

Taxon (pl.) Taxa. A taxonomic entity (e.g., species, subspecies, or variety) or a group of such entities.

Technical Order. A document issued by the Air Force that defines the technical details of a system or parts of a system, and may include data on assembly, repair, maintenance, storage, operation, and disposal.

Tectonics. A branch of geology that deals with the regional assembling of structural or deformational features, and includes a study of their mutual relations, origin, and historical evolution.

Temporarily Disturbed. Surfaces disturbed during construction, but later regraded and/or revegetated; or those able to return to a natural state during the operational life of the program.

Terrace. A flat portion of land created when a stream or river cuts farther into its channel and migrates laterally to a different location. In river valleys, they typically represent former levels of the valley floodplain.

Terrace Deposit. The alluvial materials comprising the topographic terrace.

Tertiary. The first period of the Cenozoic era extending between 66 and 1.6 million years ago.

Then-Year Dollars. Current dollars unadjusted for inflation.

Threatened Species. A species that is likely to become endangered in the foreseeable future.

Thrust Fault. A fault with a dip of 45 degrees or less on which the hanging wall has moved upward relative to the footwall.

Tiering. Technique of proceeding from general to specific analyses as a program evolves.

Tipi Ring/Stone Circle. A circle of stones generally measuring from 3.5 to 7 meters in diameter that is thought to represent the remains of various types of structures or to have served a religious or ceremonial function.

Ton. A unit of weight equal to 2,000 pounds.

Total Dissolved Solids. The concentration of solid materials in a solution; determined as the weight of the residue of a water sample upon filtration and evaporation decided by the volume of the sample.

Trail. A two-wheel track created only by the passage of vehicles. A trail is not a road.

Transect. A line, or a narrow corridor along a line, used for surveying the distributions of organisms; in this case, used to chart the distribution of vegetation types in the study area.

Transfer. To convey energy from one system to another via a transmission interconnection.

Transporter/Erector. A vehicle that transports a Hard Mobile Launcher, conceals it during movement, and permits its undetected emplacement or removal at a protective structure.

Transporter/Erector Routes. Roads used for the movement of Minuteman transporter/erector vehicles.

Transuranium Series. Elements with atomic numbers greater than 92, which are the products of artificial nuclear changes.

Trend. A general term for the direction or bearing of the outcrop of a geological feature of any dimension, such as a layer, fold, or fault zone.

Triassic. A period of the Mesozoic era extending from about 245 to 208 million years ago.

Turnout. A short section of a lane added to a two-lane, two-way highway for the purpose of allowing slow-moving vehicles to leave the main roadway and stop to allow faster vehicles to pass.

Two-Lane Highway. A roadway having a two-lane cross section, with one lane for each direction of flow, and where passing maneuvers must be made in the opposing lane.

Unconfined Aquifer. An aquifer where the water table is exposed to the atmosphere through openings (pores) in the overlying materials.

Unemployment Rate. The number of civilians, as a percentage of the total civilian labor force, without jobs but actively seeking employment.

Ungulates. Hoofed mammals such as horses, bison, and antelope.

Universal Soil Loss Equation. An equation that predicts the amount of soil lost to rainfall erosion, commonly measured in tons per acre per year, based on factors such as rainfall, K-factor, slope, and management practices.

Unsuccessful Jobseekers. Persons seeking employment in a given area in excess of employment demand.

Upland Game. Bird species such as grouse, quail, pheasant, and wild turkeys found in areas elevated above rivers and valleys.

Uplift. A structurally high area in the earth's crust, produced by positive movements that raise or upthrust the rocks, as in a dome or arch.

Utility Corridor. A common route used by more than one utility for transportation of energy resources.

Valley Fill. Unconsolidated sediments deposited by any agent to fill or partially fill a valley.

Visibility Degradation. Any adverse change in visibility consisting of either a reduction of visual range from some reference value, or a reduction in contrast between an object and the horizon sky, or a shift in coloration or light intensity of the sky or distant objects compared to what is perceived on a "clear day."

Vision Quest Site. A sacred area used by American Plains Indians to seek supernatural guidance through fasting and prayer, usually located on a prominence (e.g., butte, mesa, or ridgetop).

Volcanic Ash. Fine-grained material ejected from a volcano.

Volume (Transportation). The total number of vehicles that pass over a given point or section of a roadway during a given time interval. Volumes may be expressed in terms of annual, daily, hourly, or subhourly periods.

Warhead. The nuclear device contained within a reentry vehicle. Does not include the detonating mechanism and associated equipment.

Warlodges. Vertical pole conical lodges, usually located in wooded breaks and associated with eagle-trapping pits.

Water Body. Any surface water, including streams, rivers, ponds, lakes, reservoirs, bays, sounds, estuaries, and oceans.

Water-Short Area. A stream drainage with intensive water use where several times each decade water demands exceed the available streamflow during the peak irrigation season (usually late in the summer).

Water Table. The upper surface of a zone of saturation except where the surface is formed by an impermeable body.

Watershed. See Basin.

Watt. A unit of electrical power equal to 1/756th horsepower.

Way. A vehicle route that has not been improved and maintained by mechanical means to ensure relatively regular and continuous use.

Well Yield. The sustainable volume of water discharged from a well per unit of time, often expressed in gallons per minute.

Wetlands. Transitional lands between terrestrial and aquatic systems where the water table is usually at, or near, the surface, or the land is covered by shallow water. The soil or substrate is at least periodically saturated with water.

Wild and Scenic River. A stream protected by federal legislation to maintain its scenic characteristics and natural, free-flowing state.

Wilderness Area. A tract of land that has been granted congressional approval for incorporation into the National Wilderness Preservation System as mandated by the Wilderness Act of 1964 (Public Law 88-57).

Wilderness Study Area. An area determined to have wilderness characteristics, subject to interdisciplinary analysis and public comment to determine wilderness suitability. Suitable areas are recommended to the President and Congress for wilderness designation.

Wind Erosion. Detachment, transportation, and deposition of loose topsoil by wind action, as in dust storms.

Wind Erosion Equation. An equation that predicts the amount of soil lost as a result of wind erosion based on factors such as soil erodibility, climate, and vegetative cover.

Wind Shear. A stress on a body in a region in which winds of different velocities and directions are close together.

Withdrawn Lands. Federal lands where jurisdiction has been transferred from one department, bureau, or agency, to another.

Woodland. Communities dominated by trees with a usual mean height of less than 15 meters.

10.2 Acronyms

A&CO	Assembly & Checkout
AADT	Average Annual Daily Traffic
AC	Alternating Current
ACHP	Advisory Council on Historic Preservation
ADT	Average Daily Traffic
AFB	Air Force Base
AFDC	Aid to Families with Dependent Children
AFRCE	Air Force Regional Civil Engineer
AFSEM	Air Force System Evaluation Model
AICUZ	Air Installation Compatible Use Zone
AQCR	Air Quality Control Region
BAQ	Basic Allowance for Quarters
BEA	Bureau of Economic Analysis
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BN	Burlington Northern Railroad
BOD	Biochemical Oxygen Demand
BMO	Ballistic Missile Office
B.P.	Before Present
BPA	Bonneville Power Administration
CBP	County Business Patterns
CEQ	Council on Environmental Quality
CERL	Construction Engineering Research Laboratory
CETA	Comprehensive Employment Training Act
CFR	Code of Federal Regulations
CMR	Central Montana Railroad
CO	Carbon Monoxide
COE	Army Corps of Engineers
CY	Calendar Year
DAR	Defense Access Road
DFSC	Defense Fuels Supply Center
DO	Dissolved Oxygen
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EES	Energy Extension Service
EIAP	Environmental Impact Analysis Process
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EPTR	Environmental Planning Technical Report
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FHA	Federal Housing Administration
FHLBB	Federal Home Loan Bank Board
FHWA	Federal Highway Administration
FTE	Full-Time Equivalent
FY	Fiscal Year
GFPS	Great Falls Public Schools

GFTSB	Great Falls Transportation Study Boundary
GIS	Geographic Information System
GMIS	Geographic Management Information System
GMLCC	Ground Mobile Launch Control Center
HML	Hard Mobile Launcher
HQ	Headquarters
HUD	Department of Housing and Urban Development
ICBM	Intercontinental Ballistic Missile
ICP	Institutional Conservation Program
IHE	Insensitive High Explosives
IOC	Initial Operational Capability
ISC	Industrial Source Complex
JTU	Jackson Turbidity Unit
KCRA	Known Coal Resource Area
KGRA	Known Geothermal Resource Area
KGRF	Known Geothermal Resource Field
KOA	Kampground of America
LCP	Landscape Characteristic Province
LEIS	Legislative Environmental Impact Statement
LIEAP	Low-Income Energy Assistance Program
LOI	Level of Impact
LOS	Level of Service
LPG	Liquefied Petroleum Gas
MBMG	Montana Bureau of Mines and Geology
MCE	Maximum Credible Earthquake
MCP	Military Construction Program
MDFWP	Montana Department of Fish, Wildlife and Parks
MDNRC	Montana Department of Natural Resources and Conservation
MDOH	Montana Department of Highways
MFH	Military Family Housing
MMI	Modified Mercalli Intensity
MNHP	Montana Natural Heritage Program
MOU	Memorandum of Understanding
MPC	Montana Power Company
MPDES	Montana Pollutant Discharge Elimination System
MWQB	Montana Water Quality Bureau
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NCHRP	National Cooperative Highway Research Program
NEDS	National Emissions Data Systems
NEPA	National Environmental Policy Act
NIOSH	National Institute of Occupational Safety and Health
NO_2	Nitrogen Dioxide
NOAA	National Oceanic and Atmospheric Administration
NORAD	North American Air Defense
NPS	National Park Service
NRHP	National Register of Historic Places
NSCCA	Nuclear Safety Cross Check Analysis
NTU	Nephelometric Turbidity Unit
NWSSG	Nuclear Weapons System Safety Group
OEA	Office of Economic Adjustment
ORV	Off-Road Vehicle

OSHA	Occupational Safety and Health Administration
PA	Programmatic Agreement
PBV	Post Boost Vehicle
PCPH	Passenger Cars Per Hour
PHS	Potential Hazard System
PMOA	Programmatic Memorandum of Agreement
PSD	Prevention of Significant Deterioration
PVC	Polyvinyl Chloride
QF	Qualifying Facilities
RBC	Rotating Biological Contactor
ROI	Region of Influence
ROW	Right-of-Way
RV	Reentry Vehicle
SAC	Strategic Air Command
SATAF	Site Activation Task Force
SCS	Soil Conservation Service
SHPO	State Historic Preservation Officer
SPEL	Short-Term Public Emergency Limit
SPL	Sound Pressure Level
SIC	Standard Industrial Classification
SMSA	Standard Metropolitan Statistical Area
SO_2	Sulfur Dioxide
SSG	System Safety Group
STORET	Storage and Retrieval System
S.U.	Standard Unit
SWP	State Water Project
T/E	Transporter/Erector
TAC	Tactical Air Command
TDS	Total Dissolved Solids
TSD	Treatment, Storage, and Disposal
TSP	Total Suspended Particulates
TSS	Total Suspended Solids
USAF	U.S. Air Force
USBM	U.S. Bureau of Mines
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USLE	Universal Soil Loss Equation
VA	Veterans Administration
VOC	Volatile Organic Compounds
VRM	Visual Resources Management
WAPA	Western Area Power Administration
WATSTORE	Water Data Storage and Retrieval System
WEG	Wind Erosion Group
WGP	Weapons Grade Plutonium
WIC	Women/Infant/Children
WSA	Weapons Storage Area
WSCC	Western System Coordinating Council

10.3 Units of Measurement

acre-ft	acre-feet
acre-ft/yr	acre-feet per year
bbl/day	barrels per day
Bcf	billion cubic feet
°C	degrees centigrade
cfs	cubic feet per second
CY	calendar year
cy	cubic yard
cy/yr	cubic yard per year
dB	decibel
dBA	decibel on the A-weighted scale
°F	degrees Fahrenheit
ft	foot
g	gravitational acceleration (32 ft/sec^2)
gpcd	gallon per capita per day
gpd	gallon per day
gpm	gallon per minute
in/yr	inch per year
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
lb/day	pound per day
L_{dn}	day/night equivalent noise level
L_{eq}	energy-equivalent continuous noise level
MBtu/h	million British thermal units per hour
Mcf	thousand cubic feet
MG	million gallons
MGD	million gallons per day
mg/l	milligram per liter
mg/m^3	milligram per cubic meter
ml	milliliter
MMcf	million cubic feet
mph	miles per hour
mrad	millirad
MVA	megavolt-ampere
MW	megawatt
MWh	megawatt-hour
ppm	parts per million
sq ft	square foot
sq km	square kilometer
sq mi	square mile
T/ac/yr	ton per acre per year
T/day	ton per day
T/yr	ton per year
)g/m^3	microgram per cubic meter

11.0 INDEX

This index lists the cities and counties discussed in this document.

APPENDIX A

Appendix A

EXISTING ENVIRONMENTAL CONDITIONS AT LAUNCH FACILITIES IN MONTANA

This appendix provides a summary of the environmental conditions at existing Minuteman launch facilities in north-central Montana. The following information is provided for each launch facility:

Surface Area (acres) - The size of Air Force fee-owned land at each launch facility.

Distance to Malmstrom Air Force Base (mi) - The shortest road distance, on the transporter/erector (T/E) route system, from each launch facility to Malmstrom Air Force Base.

Length of Access Road (ft) - The length of gravel access road connecting each launch facility to the T/E route system.

Vegetation - The dominant vegetation types found in a 207-acre study area block surrounding each launch facility.

Wildlife - The wildlife species whose ranges encompass the launch facility.

Proximity of Aquatic Habitats - Aquatic habitats (wetlands, streams, washes, and ponds) were cataloged in three zones (adjacent to, less than 500 ft, and 500-1,000 ft from a launch facility). The listing indicates a presence of an aquatic habitat in the nearest zone. "None" indicates that no aquatic habitats occur within 1,000 feet of the launch facility.

Threatened and Endangered Species - Includes federally listed, federal-candidate, and Montana-recognized species whose ranges encompass the launch facility.

Oil and Gas Lease Less Than 0.5 Mile - Existing oil and gas leases which occur within 0.5 mile of each launch facility.

Sheet Erosion K-Factor - Estimated value that predicts long-term average soil loss resulting from sheet erosion. K-factors range from 0.02 to 0.69 with soils having high susceptibilities to sheet erosion having K-factors greater than 0.43.

Wind Erodibility Group - Estimated measure of the soil's susceptibility to wind erosion. Group numbers range from a highest sensitive soil group of 1 to the least sensitive soil group of 8.

Slope (%) - Surface slope at each launch facility.

River Basin - The principal surface drainage basin in which the launch facility is located.

Principal Groundwater Aquifer - The regional groundwater aquifer most likely tapped by any wells which may lie in the vicinity of the launch facility.

Nearby Saline Seep - Saline seeps that lie within 0.5 mile of the launch facility, as determined from 1986 aerial photographs.

Residential Structures Within 2,000 Feet - A census of inhabited residences located within 2,000 feet of the perimeter of each launch facility.

Dominant Land Use - An appraisal of the principal categories of land use (excluding structures) located within 300 feet of the perimeter of each launch facility.

Archaeological Sensitivity - A rating which can range from negligible to high, based on the location of launch facilities within sensitivity zones identified by a logistic regression predictive model of site occurrence. Ratings reflect the relative likelihood of encountering sites in a given zone, a characteristic which is directly related to predicted site density.

Paleontological Sensitivity - A rating which can range from negligible to high, based on the relative importance of fossil materials known to occur in surface or near-surface geologic formations at the launch facility location.

Historic Sensitivity - A rating which can range from negligible to high, based on proximity to known National Register of Historic Places-eligible properties. High sensitivity reflects the presence of an eligible site in the area of direct surface disturbance. Lower ratings reflect the presence of known sites at greater distances from the launch facility (moderate, 1 mile; low, 3 miles). These recognize the potential for affecting additional unrecorded sites at the launch facility, and the potential for indirect effects resulting from increased public use of the area.

Native American Sensitivity - A rating which can range from negligible to high, based on proximity to known or projected sacred or traditional use areas, and the resource type. High sensitivity is recorded when a launch facility occurs within 2 miles of known burial grounds in recognition of the potential to cause visual or audible intrusions to the sacred character of the site, or to affect related, unrecorded sites. Moderate sensitivity is recorded when a launch facility is identified as being within 1 mile of a known site with a ceremonial feature. Launch facilities within 5 miles of known sacred sites were rated low in recognition of the potential for encountering additional sites. Negligible sensitivity is recorded for areas where no resources are known or projected to occur.

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	A-2	A-3	A-4	A-5	A-6	A-7
Surface Area (acres)	2.314	2.205	2.328	2.059	2.847	1.969
Distance to Malmstrom AFB (mi)	28.0	56.7	38.1	58.0	51.3	45.3
Length of Access Road (ft)	420	150	240	360	1,200	750
Vegetation	Grassland	Nonirrigated agriculture	Grassland	Forest	Forest	Nonirrigated agriculture
Wildlife	White-tailed deer mule deer	White-tailed deer mule deer pronghorn	White-tailed deer mule deer pronghorn	White-tailed deer mule deer	White-tailed deer mule deer	White-tailed deer mule deer
Proximity of Aquatic Habitats (ft)	Adjacent	500-1,000	500-1,000	<500	<500	500-1,000
Threatened and Endangered Species	None	None	None	_Cirsium longistylum_	_Cirsium longistylum_	None
Oil or Gas Lease Less Than 0.5 Mile	No	No	No	No	No	No
Sheet Erosion K-Factor	0.37	0.37	0.37	N/A	N/A	0.37
Wind Erodibility Group	6	7	6	6	N/A	7
Slope (%)	>20	10-20	>20	>20	>20	10-20
River Basin	Belt Creek	Belt Creek	Belt Creek	Belt Creek	Belt Creek	Belt Creek
Principal Ground-water Aquifer	Kootenai Formation	Kootenai Formation	Mountains or igneous rock	Mountains or igneous rock	Mountains or igneous rock	Mountains or igneous rock
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	2	None	17	2
Dominant Land Use	Rangeland	Dry-farmed cropland	Rangeland	Douglas fir forest	Dry-farmed cropland/ Douglas fir forest	Dry-farmed cropland
Archaeological Sensitivity	Moderate	Moderate	Low	Low	Low	Low
Paleontological Sensitivity	Low	Low	Low	Low	Low	Low
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	A-8	A-9	A-10	A-11	B-2	B-3
Surface Area (acres)	2.463	2.029	2.029	1.753	2.190	2.210
Distance to Malmstrom AFB (mi)	34.8	21.7	25.1	28.0	71.7	83.0
Length of Access Road (ft)	315	325	225	280	375	300
Vegetation	Grassland	Nonirrigated agriculture/ grassland	Grassland/ nonirrigated agriculture	Grassland/ nonirrigated agriculture	Grassland/ nonirrigated agriculture	Nonirrigated agriculture
Wildlife	White-tailed deer mule deer	White-tailed deer mule deer pronghorn	White-tailed deer mule deer pronghorn	White-tailed deer mule deer	Mule deer pronghorn	Mule deer pronghorn
Proximity of Aquatic Habitats (ft)	Adjacent	None	<500	500-1,000	500-1,000	<500
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	Yes	Yes	No	Yes	Yes
Sheet Erosion K-Factor	0.37	0.32	0.37	0.32	0.37	0.37
Wind Erodibility Group	6	6	5	5	6	4L
Slope (%)	10-20	5-10	10-20	>20	10-20	0-2
River Basin	Belt Creek	Sand Coulee Creek	Boxelder Creek-Missouri River	Belt Creek	Arrow Creek	Arrow Creek
Principal Ground-water Aquifer	Mountains or igneous rock	Mountains or igneous rock	Mountains or igneous rock	Kootenai Formation	Terrace or bench deposits	Terrace or bench deposits
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	3	None	None	1	None	1
Dominant Land Use	Rangeland	Dry-farmed cropland/ rangeland	Dry-farmed cropland/ rangeland	Dry-farmed cropland/ rangeland	Rangeland	Rangeland/dry-farmed cropland
Archaeological Sensitivity	Low	Moderate	Moderate	Moderate	Moderate	Moderate
Paleontological Sensitivity	Low	Moderate	Moderate	Moderate	Moderate	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	B-4	B-5	B-6	B-7	B-8	B-9
Surface Area (acres)	1.818	1.818	2.346	1.931	1.865	1.928
Distance to Malmstrom AFB (mi)	71.0	66.0	56.0	45.1	38.9	47.1
Length of Access Road (ft)	270	290	2,841	771	687	322
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture	Grassland	Nonirrigated agriculture	Nonirrigated agriculture	Grassland
Wildlife	Mule deer pronghorn	White-tailed deer mule deer	White-tailed deer mule deer pronghorn	Mule deer pronghorn	Mule deer pronghorn	White-tailed deer mule deer pronghorn
Proximity of Aquatic Habitats (ft)	<500	<500	500-1,000	<500	500-1,000	Adjacent
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	No	No	No	No	No
Sheet Erosion K-Factor	0.37	0.17	0.2	0.17	0.32	0.17
Wind Erodibility Group	6	6	5	6	7	6
Slope (%)	5-10	0-2	>20	2-5	5-10	10-20
River Basin	Judith River	Judith River	Arrow Creek	Arrow Creek	Arrow Creek	Arrow Creek
Principal Ground-water Aquifer	Terrace or bench deposits	Kootenai Formation	Kootenai Formation	Terrace or bench deposits	Kootenai Formation	Kootenai Formation
Nearby Saline Seep	No	No	No	No	No	Yes
Residential Structures Within 2,000 Feet	None	None	None	None	1	None
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland	Rangeland	Dry-farmed cropland/ rangeland	Dry-farmed cropland	Rangeland
Archaeological Sensitivity	Moderate	Low	Moderate	High	Moderate	High
Paleontological Sensitivity	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	B-10	B-11	C-2	C-3	C-4	C-5
Surface Area (acres)	2.109	2.045	1.884	1.990	1.956	1.846
Distance to Malmstrom AFB (mi)	55.9	54	65.5	75.8	77.7	72.7
Length of Access Road (ft)	220	150	255	260	320	265
Vegetation	Forest	Grassland	Grassland	Nonirrigated agriculture	Grassland	Nonirrigated agriculture
Wildlife	White-tailed deer mule deer	Mule deer pronghorn	Mule deer pronghorn	Pronghorn mule deer	Mule deer pronghorn	Mule deer pronghorn
Proximity of Aquatic Habitats (ft)	<500	<500	500-1,000	500-1,000	Adjacent	None
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	No	No	No	No	Yes
Sheet Erosion K-Factor	0.37	0.37	0.37	0.37	N/A	0.37
Wind Erodibility Group	6	5	6	6	N/A	6
Slope (%)	>20	2-5	10-20	2-5	10-20	0-2
River Basin	Arrow Creek	Arrow Creek	Judith River	Judith River	Judith River	Judith River
Principal Ground-water Aquifer	Mountains or igneous rock	Kootenai Formation	Kootenai Formation	Kootenai Formation	Kootenai Formation	Terrace or bench deposits
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	4	None	2	None	None	1
Dominant Land Use	Spruce fir forest	Rangeland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland/ rangeland	Dry-farmed cropland
Archaeological Sensitivity	Moderate	High	Moderate	High	High	Low
Paleontological Sensitivity	Low	Moderate	Low	Low	Low	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	C-6	C-7	C-8	C-9	C-10	C-11
Surface Area (acres)	2.178	2.314	2.218	2.571	2.330	2.066
Distance to Malmstrom AFB (mi)	79.3	86.8	76.3	72.9	65.1	58.4
Length of Access Road (ft)	573	474	284	400	440	755
Vegetation	Grassland	Grassland	Grassland/forest	Grassland/forest	Grassland	Nonirrigated agriculture/ irrigated agriculture
Wildlife	White-tailed deer mule deer pronghorn	White-tailed deer mule deer pronghorn	White-tailed deer mule deer pronghorn	Mule deer	White-tailed deer mule deer pronghorn	White-tailed deer mule deer pronghorn
Proximity of Aquatic Habitats (ft)	<500	<500	500-1,000	None	<500	Adjacent
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	Yes	No	No	Yes	No
Sheet Erosion K-Factor	0.32	0.32	0.43	0.2	0.32	0.37
Wind Erodibility Group	6	6	4L	6	7	6
Slope (%)	5-10	10-20	10-20	>20	>20	0-2
River Basin	Judith River	Judith River	Judith River	Judith River	Judith River	Judith River
Principal Ground-water Aquifer	Kootenai Formation	Mountains or igneous rock	Mountains or igneous rock	Mountains or igneous rock	Mountains or igneous rock	Terrace or bench deposits
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	1	None	None	5
Dominant Land Use	Rangeland	Rangeland	Douglas fir forest	Douglas fir forest	Rangeland	Dry-farmed cropland
Archaeological Sensitivity	Moderate	High	Low	Low	Moderate	High
Paleontological Sensitivity	Moderate	Low	Low	Moderate	Moderate	Moderate
Historic Sensitivity	Moderate	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Low	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	D-2	D-3	D-4	D-5	D-6	D-7
Surface Area (acres)	1.690	2.107	1.940	1.923	2.020	1.990
Distance to Malmstrom AFB (mi)	111	118	112.2	104.9	104.1	98.0
Length of Access Road (ft)	230	900	275	255	270	260
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture/forest	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Grassland/ nonirrigated agriculture
Wildlife	Mule deer pronghorn	Mule deer pronghorn	Mule deer pronghorn	Mule deer pronghorn	Mule deer pronghorn white-tailed deer	Mule deer pronghorn
Proximity of Aquatic Habitats (ft)	None	Adjacent	<500	500-1,000	None	500-1,000
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	No	No	No	No	No
Sheet Erosion K-Factor	0.37	0.28	0.37	0.32	0.37	0.37
Wind Erodibility Group	6	6	6	4	6	4
Slope (%)	0-2	>20	5-10	5-10	2-5	>20
River Basin	Judith River	Judith River	Judith River	Judith River	Judith River	Judith River
Principal Ground-water Aquifer	Eagle/Virgelle Formation	Eagle/Virgelle Formation	Eagle/Virgelle Formation	Eagle/Virgelle Formation	Kootenai Formation	Kootenai Formation
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	1	1
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland/ rangeland
Archaeological Sensitivity	Moderate	Low	Moderate	Moderate	Moderate	Moderate
Paleontological Sensitivity	Moderate	Moderate	Low	Moderate	Moderate	Low
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Low	Low
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Low	Low

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	D-8	D-9	D-10	D-11	E-2	E-3
Surface Area (acres)	2.119	1.716	1.690	1.663	2.029	2.129
Distance to Malmstrom AFB (mi)	94.2	90.4	90.2	104.0	150.2	140.2
Length of Access Road (ft)	145	270	235	150	270	750
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Grassland
Wildlife	Mule deer pronghorn	Mule deer pronghorn	Mule deer pronghorn	Mule deer pronghorn	Mule deer pronghorn	Mule deer pronghorn
Proximity of Aquatic Habitats (ft)	<500	500-1,000	None	500-1,000	Adjacent	Adjacent
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	No	No	No	Yes	Yes
Sheet Erosion K-Factor	0.28	0.37	0.37	0.32	0.32	0.43
Wind Erodibility Group	6	6	6	3	3	6
Slope (%)	10-20	5-10	0-2	0-2	5-10	10-20
River Basin	Judith River	Judith River	Arrow Creek	Judith River	Dog Creek	Dog Creek
Principal Ground-water Aquifer	Kootenai Formation	Kootenai Formation	Terrace or bench deposits	Eagle/Virgelle Formation	Judith River Formation	Judith River Formation
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	1	1	None	2	None	2
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Rangeland
Archaeological Sensitivity	Low	Low	Low	Moderate	Moderate	Low
Paleontological Sensitivity	Low	Low	Moderate	Moderate	Moderate	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Low	Low
Native American Sensitivity	Negligible	Moderate	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	E-4	E-5	E-6	E-7	E-8	E-9
Surface Area (acres)	1.912	1.928	1.894	1.763	1.846	2.755
Distance to Malmstrom AFB (mi)	150.5	145.0	126.9	120.4	118.3	126.9
Length of Access Road (ft)	360	2,711	500	530	245	425
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture/grassland	Nonirrigated agriculture/grassland	Nonirrigated agriculture	Nonirrigated agriculture/grassland	Grassland
Wildlife	Mule deer pronghorn	Mule deer pronghorn	Mule deer white-tailed deer pronghorn	Mule deer pronghorn	White-tailed deer mule deer pronghorn	Mule deer pronghorn
Proximity of Aquatic Habitats (ft)	500-1,000	Adjacent	<500	<500	Adjacent	Adjacent
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	No	No	Yes	Yes	No
Sheet Erosion K-Factor	0.43	0.32	0.32	0.32	0.2	0.37
Wind Erodibility Group	4	6	6	4	4L	4
Slope (%)	5-10	5-10	5-10	5-10	5-10	10-20
River Basin	Dog Creek	Dog Creek	Dog Creek	Dog Creek	Judith River	Judith River
Principal Ground-water Aquifer	Judith River Formation	Judith River Formation	Judith River Formation	Eagle/Virgelle Formation	Eagle/Virgelle Formation	Eagle/Virgelle Formation
Nearby Saline Seep	Yes	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	None	1
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland/ rangeland	Dry-farmed cropland/ rangeland	Dry-farmed cropland/ rangeland	Rangeland/dry-farmed cropland	Rangeland
Archaeological Sensitivity	Low	Low	Moderate	Low	Low	Low
Paleontological Sensitivity	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Low
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	E-10	E-11	F-2	F-3	F-4	F-5
Surface Area (acres)	2.404	1.837	2.0	1.969	1.873	1.826
Distance to Malmstrom AFB (mi)	143.7	147.6	67.3	73.9	50.7	52.6
Length of Access Road (ft)	1,624	155	380	780	775	270
Vegetation	Grassland	Nonirrigated agriculture	Grassland	Nonirrigated agriculture/grassland	Irrigated agriculture	Grassland
Wildlife	Mule deer pronghorn	Mule deer pronghorn	Mule deer pronghorn	Mule deer pronghorn	Mule deer pronghorn	Mule deer pronghorn white-tailed deer elk
Proximity of Aquatic Habitats (ft)	<500	<500	None	Adjacent	None	<500
Threatened and Endangered Species	None	None	None	Bald eagle	Bald eagle	Bald eagle
Oil or Gas Lease Less Than 0.5 Mile	No	No	Yes	No	No	Yes
Sheet Erosion K-Factor	0.37	0.37	0.37	0.43	N/A	0.37
Wind Erodibility Group	4	7	4L	4	N/A	4L
Slope (%)	10-20	5-10	10-20	10-20	10-20	5-10
River Basin	Judith River	Arrow Creek	Teton River	Sun River	Sun River	Sun River
Principal Ground-water Aquifer	Eagle/Virgelle Formation	Eagle/Virgelle Formation	Eagle/Virgelle Formation	Terrace or bench deposits	Two Medicine Formation	Two Medicine Formation
Nearby Saline Seep	No	Yes	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	None	None
Dominant Land Use	Douglas fir forest/ rangeland	Dry-farmed cropland	Rangeland	Dry-farmed cropland/ rangeland	Irrigated cropland	Rangeland
Archaeological Sensitivity	High	Low	Moderate	Low	Moderate	Moderate
Paleontological Sensitivity	Moderate	Moderate	Negligible	Moderate	Moderate	Moderate
Historic Sensitivity	Negligible	Low	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	F-6	F-7	F-8	F-9	F-10	F-11
Surface Area (acres)	1.791	1.772	2.563	1.808	2.346	2.438
Distance to Malmstrom AFB (mi)	61.3	64.5	77.6	82.3	72.5	70.3
Length of Access Road (ft)	1,100	185	290	20,000	1,070	275
Vegetation	Grassland/ nonirrigated agriculture	Grassland	Grassland/ nonirrigated agriculture	Grassland	Grassland	Grassland
Wildlife	White-tailed deer mule deer	Pronghorn white-tailed deer elk	Mule deer	Mule deer white-tailed deer elk	White-tailed deer mule deer elk	Mule deer white-tailed deer elk
Proximity of Aquatic Habitats (ft)	Adjacent	500-1,000	None	None	None	500-1,000
Threatened and Endangered Species	Bald eagle	None	Bald eagle grizzly bear wolf	Bald eagle grizzly bear wolf	Bald eagle grizzly bear wolf	Bald eagle grizzly bear wolf
Oil or Gas Lease Less Than 0.5 Mile	Yes	Yes	No	Yes	No	Yes
Sheet Erosion K-Factor	0.37	0.37	N/A	0.37	0.37	0.37
Wind Erodibility Group	4L	4	N/A	4L	5	4L
Slope (%)	10-20	5-10	10-20	0-2	5-10	2-5
River Basin	Sun River	Sun River	Sun River	Teton River	Teton River	Teton River
Principal Ground-water Aquifer	Glacial deposits	Glacial deposits	Two Medicine Formation	Two Medicine Formation	Two Medicine Formation	Two Medicine Formation
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	None	None
Dominant Land Use	Dry-farmed cropland/ rangeland	Rangeland	Rangeland	Rangeland	Rangeland	Rangeland
Archaeological Sensitivity	Moderate	Moderate	Moderate	High	Moderate	High
Paleontological Sensitivity	Moderate	Moderate	Moderate	Moderate	High	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Low	Negligible	Negligible	High	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	G-2	G-3	G-4	G-5	G-6	G-7
Surface Area (acres)	2.376	2.298	2.029	3.030	1.837	3.182
Distance to Malmstrom AFB (mi)	46.5	42.5	37.0	43.3	64.1	61.1
Length of Access Road (ft)	1,010	250	230	190	370	1,020
Vegetation	Grassland	Grassland	Nonirrigated agriculture/ irrigated agriculture	Grassland	Grassland	Grassland
Wildlife	Pronghorn mule deer	Pronghorn	Pronghorn	Pronghorn	Pronghorn mule deer	White-tailed deer pronghorn mule deer
Proximity of Aquatic Habitats (ft)	500-1,000	Adjacent	None	<500	<500	Adjacent
Threatened and Endangered Species	None	None	None	None	Lesquerella klausii	Lesquerella klausii
Oil or Gas Lease Less Than 0.5 Mile	No	Yes	Yes	No	No	Yes
Sheet Erosion K-Factor	0.49	0.28	0.28	0.37	0.37	0.37
Wind Erodibility Group	6	5	7	4L	4L	4L
Slope (%)	2-5	10-20	5-10	>20	2-5	5-10
River Basin	Sun River	Little Muddy Creek	Little Muddy Creek	Little Muddy Creek	Dearborn River	Dearborn River
Principal Ground-water Aquifer	Eagle/Virgelle Formation	Kootenai Formation	Kootenai Formation	Mountains or igneous rock	Two Medicine Formation	Two Medicine Formation
Nearby Saline Seep	No	Yes	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	1	None	None
Dominant Land Use	Rangeland	Rangeland	Dry-farmed cropland/ rangeland	Rangeland	Rangeland	Rangeland
Archaeological Sensitivity	Low	Moderate	Low	Moderate	Moderate	Moderate
Paleontological Sensitivity	Moderate	Low	Low	Moderate	Moderate	Low
Historic Sensitivity	Negligible	Negligible	Negligible	Moderate	Negligible	Negligible
Native American Sensitivity	Negligible	Low	Negligible	Low	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	G-8	G-9	G-10	G-11	H-2	H-3
Surface Area (acres)	2.355	2.367	1.837	2.029	1.894	1.961
Distance to Malmstrom AFB (mi)	69.9	60.5	70.8	55.6	47.6	38.2
Length of Access Road (ft)	375	970	140	3,440	275	155
Vegetation	Grassland	Nonirrigated agriculture	Nonirrigated agriculture	Grassland	Nonirrigated agriculture	Grassland
Wildlife	White-tailed deer mule deer	Pronghorn mule deer	Pronghorn mule deer	Mule deer pronghorn	Pronghorn	Pronghorn
Proximity of Aquatic Habitats (ft)	<500	<500	500-1,000	<500	None	None
Threatened and Endangered Species	Lesquerella klausii	Lesquerella klausii	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	No	Yes	Yes	No	Yes
Sheet Erosion K-Factor	0.37	0.37	N/A	0.49	0.43	0.43
Wind Erodibility Group	4	4	N/A	6	4	4
Slope (%)	10-20	10-20	5-10	5-10	2-5	5-10
River Basin	Dearborn River	Sun River	Sun River	Sun River	Muddy Creek-Sun River	Muddy Creek-Sun River
Principal Ground-water Aquifer	Two Medicine Formation	Two Medicine Formation	Terrace or bench deposits	Two Medicine Formation	Kootenai Formation	Kootenai Formation
Nearby Saline Seep	No	No	Yes	No	Yes	Yes
Residential Structures Within 2,000 Feet	None	None	None	None	None	None
Dominant Land Use	Rangeland	Dry-farmed cropland/ rangeland	Dry-farmed cropland	Rangeland	Dry-farmed cropland	Rangeland/ dry-farmed cropland
Archaeological Sensitivity	Moderate	Moderate	High	Moderate	Low	High
Paleontological Sensitivity	Low	Moderate	Moderate	Moderate	Low	Low
Historic Sensitivity	Negligible	Negligible	Low	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	H-4	H-5	H-6	H-7	H-8	H-9
Surface Area (acres)	1.894	2.571	2.190	1.990	2.146	1.730
Distance to Malmstrom AFB (mi)	28.9	33.4	35.9	40.3	45.4	44.4
Length of Access Road (ft)	270	325	935	890	965	1,880
Vegetation	Irrigated agriculture	Grassland	Grassland	Grassland	Grassland	Irrigated agriculture/ nonirrigated agriculture
Wildlife	Pronghorn	Pronghorn	Pronghorn	Pronghorn	White-tailed deer pronghorn elk mule deer	Pronghorn
Proximity of Aquatic Habitats (ft)	None	500-1,000	Adjacent	<500	Adjacent	None
Threatened and Endangered Species	None	None	None	None	None	Bald eagle
Oil or Gas Lease Less Than 0.5 Mile	No	Yes	Yes	Yes	Yes	Yes
Sheet Erosion K-Factor	0.37	0.43	0.37	0.32	0.37	0.37
Wind Erodibility Group	4	3	4	3	4L	6
Slope (%)	10-20	10-20	10-20	10-20	5-10	2-5
River Basin	Muddy Creek-Sun River	Sun River	Sun River	Sun River	Sun River	Sun River
Principal Ground-water Aquifer	Kootenai Formation	Terrace or bench deposits	Kootenai Formation	Kootenai Formation	Alluvium or thick colluvium	Kootenai Formation
Nearby Saline Seep	No	No	Yes	No	No	No
Residential Structures Within 2,000 Feet	5	1	1	None	None	1
Dominant Land Use	Irrigated cropland	Dry-farmed cropland/ rangeland	Rangeland	Rangeland	Rangeland	Dry-farmed cropland/ irrigated cropland
Archaeological Sensitivity	Moderate	Moderate	Low	Moderate	High	Moderate
Paleontological Sensitivity	Low	Low	Low	Low	Moderate	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	H-10	H-11	I-2	I-3	I-4	I-5
Surface Area (acres)	1.980	1.791	1.873	1.980	1.834	1.923
Distance to Malmstrom AFB (mi)	53.7	59.6	25.7	46.1	45.6	38.6
Length of Access Road (ft)	495	300	210	180	280	250
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture	Grassland/nonirrigated agriculture	Grassland	Grassland	Grassland
Wildlife	Pronghorn white-tailed deer	Pronghorn	Pronghorn	Pronghorn white-tailed deer	Pronghorn white-tailed deer	Pronghorn white-tailed deer
Proximity of Aquatic Habitats (ft)	None	None	<500	None	500-1,000	500-1,000
Threatened and Endangered Species	Bald eagle	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	No	No	No	Yes	No
Sheet Erosion K-Factor	0.37	0.32	0.37	0.37	0.24	0.49
Wind Erodibility Group	5	6	5	6	8	6
Slope (%)	5-10	2-5	5-10	2-5	5-10	2-5
River Basin	Teton River	Muddy Creek-Sun River	Smith River	Hound Creek-Missouri River	Hound Creek-Missouri River	Upper Missouri River
Principal Ground-water Aquifer	Kootenai Formation	Kootenai Formation	Mountains or igneous rock	Kootenai Formation	Kootenai Formation	Kootenai Formation
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	None	None
Dominant Land Use	Rangeland/dry-farmed cropland	Dry-farmed cropland	Rangeland/dry-farmed cropland	Rangeland/dry-farmed cropland	Rangeland	Rangeland
Archaeological Sensitivity	Moderate	Low	Moderate	High	Moderate	Moderate
Paleontological Sensitivity	Moderate	Moderate	Moderate	Low	Low	Low
Historic Sensitivity	Moderate	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	I-6	I-7	I-8	I-9	I-10	I-11
Surface Area (acres)	1.873	1.923	1.873	1.837	1.763	1.873
Distance to Malmstrom AFB (mi)	31.7	23.5	39.1	37.3	18.4	20.5
Length of Access Road (ft)	490	6,575	260	270	1,065	2,775
Vegetation	Grassland	Grassland/nonirrigated agriculture	Grassland	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture
Wildlife	White-tailed deer pronghorn	White-tailed deer pronghorn	Pronghorn	Pronghorn	White-tailed deer	Pronghorn
Proximity of Aquatic Habitats (ft)	500-1,000	None	Adjacent	None	None	Adjacent
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	No	Yes	Yes	No	Yes
Sheet Erosion K-Factor	0.32	0.32	0.43	0.28	0.43	0.43
Wind Erodibility Group	6	5	6	6	6	6
Slope (%)	2-5	5-10	5-10	0.2	2-5	5-10
River Basin	Upper Missouri River	Upper Missouri River	Little Muddy Creek-Missouri River	Sun River	Muddy Creek-Sun River	Upper Missouri River
Principal Ground-water Aquifer	Kootenai Formation	Kootenai Formation	Kootenai Formation	Kootenai Formation	Kootenai Formation	Kootenai Formation
Nearby Saline Seep	No	No	No	Yes	No	Yes
Residential Structures Within 2,000 Feet	None	None	None	None	3	None
Dominant Land Use	Rangeland	Dry-farmed cropland/rangeland	Rangeland/dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland
Archaeological Sensitivity	High	Moderate	Moderate	Moderate	Moderate	Moderate
Paleontological Sensitivity	Moderate	Low	Low	Low	Moderate	Low
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Moderate	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	J-2	J-3	J-4	J-5	J-6	J-7
Surface Area (acres)	2.107	1.894	2.893	1.894	1.837	1.818
Distance to Malmstrom AFB (mi)	61.6	35.5	36.1	29.6	27.2	20.2
Length of Access Road (ft)	205	240	8,861	1,675	155	320
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture
Wildlife	Pronghorn mule deer	Pronghorn mule deer	Pronghorn mule deer	Pronghorn mule deer	Pronghorn mule deer	Pronghorn mule deer
Proximity of Aquatic Habitats (ft)	None	None	<500	None	None	None
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	Yes	Yes	Yes	Yes	No	Yes
Sheet Erosion K-Factor	0.37	0.37	0.43	0.43	0.43	0.37
Wind Erodibility Group	6	6	6	6	6	4L
Slope (%)	2-5	2-5	2-5	0-2	2-5	5-10
River Basin	Teton River	Teton River	Teton River	Teton River	Teton River	Teton River
Principal Ground-water Aquifer	Glacial deposits	Glacial deposits	Glacial deposits	Glacial deposits	Glacial deposits	Glacial deposits
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	1 (plus 1 school)	None
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland
Archaeological Sensitivity	Low	Low	Moderate	Low	Low	Low
Paleontological Sensitivity	Low	Low	Low	Low	Low	Low
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Low
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	J-8	J-9	J-10	J-11	K-2	K-3
Surface Area (acres)	1.951	1.865	1.894	1.894	1.627	1.865
Distance to Malmstrom AFB (mi)	37.5	29.4	32.3	36.8	117.0	127.8
Length of Access Road (ft)	245	235	210	290	805	285
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture	Grassland	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture
Wildlife	Pronghorn mule deer	Pronghorn mule deer	Pronghorn mule deer	Pronghorn mule deer	Pronghorn	Pronghorn
Proximity of Aquatic Habitats (ft)	None	Adjacent	None	None	None	<500
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	Yes	Yes	No	No	No
Sheet Erosion K-Factor	0.37	0.32	0.43	0.43	0.37	0.37
Wind Erodibility Group	5	7	6	4	4L	4L
Slope (%)	0-2	2-5	2-5	2-5	0-2	0-2
River Basin	Middle Missouri River	Middle Missouri River	Muddy Creek-Sun River	Teton River	Musselshell River	Musselshell River
Principal Ground-water Aquifer	Kootenai Formation	Kootenai Formation	Kootenai Formation	Kootenai Formation	Terrace or bench deposits	Judith River Formation
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	4	None	None	None
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland	Rangeland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland
Archaeological Sensitivity	Low	Low	Moderate	Low	Moderate	Moderate
Paleontological Sensitivity	Low	Low	Low	Low	Moderate	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Low
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	K-4	K-5	K-6	K-7	K-8	K-9
Surface Area (acres)	1.807	1.846	1.742	1.951	1.923	1.818
Distance to Malmstrom AFB (mi)	150.5	143.4	130.4	142.9	130.3	146.7
Length of Access Road (ft)	240	840	1,970	250	925	260
Vegetation	Grassland	Nonirrigated agriculture/grassland	Grassland	Nonirrigated agriculture	Irrigated agriculture/grassland	Nonirrigated agriculture
Wildlife	Pronghorn	Pronghorn	Pronghorn	Pronghorn	Pronghorn	Pronghorn
Proximity of Aquatic Habitats (ft)	<500	None	Adjacent	500-1,000	500-1,000	500-1,000
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	Yes	No	No	No	No	Yes
Sheet Erosion K-Factor	0.43	0.37	0.2	0.37	0.37	0.24
Wind Erodibility Group	4	5	5	4	6	3
Slope (%)	2-5	5-10	2-5	5-10	2-5	5-10
River Basin	Musselshell River	Musselshell River	Musselshell River	Musselshell River	Musselshell River	Musselshell River
Principal Ground-water Aquifer	Terrace or bench deposits	Terrace or bench deposits	Kootenai Formation	Kootenai Formation	Kootenai Formation	Eagle/Virgelle Formation
Nearby Saline Seep	Yes	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	1	None	None	None	None
Dominant Land Use	Rangeland	Dry-farmed cropland	Rangeland	Dry-farmed cropland	Irrigated cropland/ rangeland	Dry-farmed cropland
Archaeological Sensitivity	High	Moderate	High	High	Moderate	Moderate
Paleontological Sensitivity	Moderate	Moderate	Moderate	Low	Moderate	Low
Historic Sensitivity	Negligible	Low	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A

Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	K-10	K-11	L-2	L-3	L-4	L-5
Surface Area (acres)	1.818	1.856	2.346	2.089	1.818	1.837
Distance to Malmstrom AFB (mi)	133.4	141.1	110.3	110.8	117.8	158.0
Length of Access Road (ft)	245	225	220	1,995	230	150
Vegetation	Grassland	Nonirrigated agriculture	Nonirrigated agriculture/grassland	Grassland	Nonirrigated agriculture	Grassland/ nonirrigated agriculture
Wildlife	Pronghorn	Pronghorn	Pronghorn mule deer	Pronghorn	Pronghorn	Pronghorn
Proximity of Aquatic Habitats (ft)	500-1,000	None	<500	Adjacent	<500	Adjacent
Threatened and Endangered Species	None	None	Mountain plover	Mountain plover	Mountain plover	Mountain plover
Oil or Gas Lease Less Than 0.5 Mile	Yes	Yes	No	Yes	No	Yes
Sheet Erosion K-Factor	0.2	N/A	0.37	0.37	0.2	0.37
Wind Erodibility Group	4L	4L	6	4L	6	4L
Slope (%)	0-2	0-2	10-20	10-20	2-5	0-2
River Basin	Musselshell River	Musselshell River	Judith River	Musselshell River	Musselshell River	Musselshell River
Principal Ground-water Aquifer	Terrace or bench deposits	Terrace or bench deposits	Mountains or igneous rock	Terrace or bench deposits	Terrace or bench deposits	Terrace or bench deposits
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	None	None
Dominant Land Use	Rangeland/ dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland/ rangeland	Rangeland	Dry-farmed cropland	Rangeland/ dry-farmed cropland
Archaeological Sensitivity	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Paleontological Sensitivity	Moderate	Moderate	Low	Moderate	Moderate	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	L-6	L-7	L-8	L-9	L-10	L-11
Surface Area (acres)	1.742	1.873	2.068	1.780	1.873	1.912
Distance to Malmstrom AFB (mi)	123.6	109.2	111.9	97.6	99.0	92.3
Length of Access Road (ft)	235	865	500	235	780	765
Vegetation	Grassland	Nonirrigated agriculture	Grassland	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture
Wildlife	Pronghorn	Pronghorn	Pronghorn	Pronghorn mule deer	Pronghorn mule deer	Pronghorn mule deer
Proximity of Aquatic Habitats (ft)	500-1,000	None	<500	<500	<500	None
Threatened and Endangered Species	Mountain plover	Mountain plover	Mountain plover	Mountain plover	Mountain plover	Mountain plover
Oil or Gas Lease Less Than 0.5 Mile	Yes	Yes	No	Yes	Yes	Yes
Sheet Erosion K-Factor	0.2	0.37	0.2	0.17	0.37	0.37
Wind Erodibility Group	4L	4L	4L	6	6	5
Slope (%)	0-2	0-2	10-20	2-5	2-5	5-10
River Basin	Musselshell River	Musselshell River	Musselshell River	Judith River	Judith River	Judith River
Principal Ground-water Aquifer	Judith River Formation	Terrace or bench deposits	Kootenai Formation	Terrace or bench deposits	Kootenai Formation	Kootenai Formation
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	None	None
Dominant Land Use	Rangeland	Dry-farmed cropland	Rangeland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland
Archaeological Sensitivity	High	Moderate	Moderate	High	High	High
Paleontological Sensitivity	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Low	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	M-2	**M-3**	**M-4**	**M-5**	**M-6**	**M-7**
Surface Area (acres)	2.119	1.856	1.616	2.0	1.990	2.029
Distance to Malmstrom AFB (mi)	120.4	115.0	110.1	99.9	101.6	87.0
Length of Access Road (ft)	250	2,190	265	670	310	745
Vegetation	Grassland	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture/grassland	Nonirrigated agriculture
Wildlife	White-tailed deer mule deer	Mule deer white-tailed deer	Mule deer white-tailed deer	White-tailed deer	White-tailed deer mule deer pronghorn	Pronghorn mule deer
Proximity of Aquatic Habitats (ft)	Adjacent	<500	<500	None	<500	500-1,000
Threatened and Endangered Species	None	None	None	None	Mountain plover	Mountain plover
Oil or Gas Leasė Less Than 0.5 Mile	No	No	No	Yes	No	No
Sheet Erosion K-Factor	0.37	0.2	0.37	0.37	0.2	0.37
Wind Erodibility Group	4L	4L	6	6	5	6
Slope (%)	5-10	5-10	5-10	0-2	10-20	5-10
River Basin	Judith River	Judith River	Judith River	Judith River	Judith River	Judith River
Principal Ground-water Aquifer	Kootenai Formation	Kootenai Formation	Kootenai Formation	Terrace or bench deposits	Kootenai Formation	Terrace or bench deposits
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	4	None	None	4	None	3
Dominant Land Use	Rangeland	Dry-farmed cropland/ rangeland	Dry-farmed cropland/ rangeland	Dry-farmed cropland	Dry-farmed cropland/ rangeland	Dry-farmed cropland
Archaeological Sensitivity	Moderate	Moderate	Moderate	High	Moderate	High
Paleontological Sensitivity	Low	Moderate	Moderate	Moderate	Low	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Moderate
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	M-8	M-9	M-10	M-11	N-2	N-3
Surface Area (acres)	1.894	1.894	2.323	2.037	1.807	1.932
Distance to Malmstrom AFB (mi)	86.5	78.9	87.5	97.2	130.1	135.4
Length of Access Road (ft)	820	820	520	820	235	1,180
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture/grassland	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture
Wildlife	Pronghorn	Pronghorn	Pronghorn	Pronghorn	Pronghorn	Pronghorn
Proximity of Aquatic Habitats (ft)	500-1,000	500-1,000	<500	500-1,000	None	<500
Threatened and Endangered Species	Mountain plover	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	Yes	Yes	Yes	Yes	Yes	Yes
Sheet Erosion K-Factor	0.43	0.2	0.37	0.32	0.37	0.32
Wind Erodibility Group	6	5	6	4L	4	6
Slope (%)	2-5	0-2	>20	2-5	5-10	2-5
River Basin	Judith River	Judith River	Judith River	Judith River	Musselshell River	Musselshell River
Principal Ground-water Aquifer	Terrace or bench deposits	Terrace or bench deposits	Kootenai Formation	Terrace or bench deposits	Kootenai Formation	Kootenai Formation
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	1	2
Dominant Land Use	Rangeland/ dry-farmed cropland	Dry-farmed cropland	Rangeland/ dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland/ rangeland
Archaeological Sensitivity	Moderate	Moderate	High	Moderate	Low	High
Paleontological Sensitivity	Moderate	Low	Moderate	Moderate	Low	Low
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	N-4	N-5	N-6	N-7	N-8	N-9
Surface Area (acres)	4.483	2.013	2.748	2.059	1.951	2.078
Distance to Malmstrom AFB (mi)	124.4	129.1	118.7	117.1	110.2	104.9
Length of Access Road (ft)	235	270	1,725	310	225	625
Vegetation	Nonirrigated agriculture/forest/ grassland	Nonirrigated agriculture/grassland	Grassland	Nonirrigated 'agriculture	Nonirrigated agriculture	Grassland
Wildlife	Pronghorn	Pronghorn mule deer	Pronghorn mule deer	Pronghorn mule deer	White-tailed deer	Pronghorn
Proximity of Aquatic Habitats (ft)	Adjacent	<500	<500	Adjacent	Adjacent	Adjacent
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	No	No	No	No	No
Sheet Erosion K-Factor	0.37	0.2	0.37	0.2	0.28	0.32
Wind Erodibility Group	5	6	5	6	5	6
Slope (%)	>20	>20	>20	10-20	10-20	10-20
River Basin	Musselshell River	Musselshell River	Musselshell River	Judith River	Judith River	Judith River
Principal Ground-water Aquifer	Mountains or igneous rock	Mountains or igneous rock	Mountains or igneous rock	Mountains or igneous rock	Kootenai Formation	Kootenai Formation
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	1	1
Dominant Land Use	Rangeland/ ponderosa pine forest/ dry-farmed cropland	Dry-farmed cropland/ rangeland	Rangeland/ ponderosa pine forest	Dry-farmed cropland	Dry-farmed cropland	Rangeland
Archaeological Sensitivity	Moderate	Low	Moderate	High	Moderate	Moderate
Paleontological Sensitivity	Moderate	High	Moderate	Low	Moderate	Low
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	N-10	N-11	O-2	O-3	O-4	O-5
Surface Area (acres)	3.057	2.561	2.303	1.932	2.037	1.970
Distance to Malmstrom AFB (mi)	117.6	124.3	144.2	151.1	146.0	152.0
Length of Access Road (ft)	550	770	270	2,945	305	435
Vegetation	Grassland	Grassland	Grassland	Grassland/nonirrigated agriculture	Grassland	Nonirrigated agriculture/grassland
Wildlife	Pronghorn	Mule deer white-tailed deer pronghorn	Pronghorn	Pronghorn	Pronghorn	Pronghorn
Proximity of Aquatic Habitats (ft)	Adjacent	<500	Adjacent	500-1,000	500-1,000	<500
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	No	Yes	Yes	No	Yes
Sheet Erosion K-Factor	0.37	0.37	0.37	0.37	0.37	0.43
Wind Erodibility Group	5	4	4	4	6	4
Slope (%)	10-20	10-20	5-10	5-10	2-5	10-20
River Basin	Musselshell River	Musselshell River	Musselshell River	Musselshell River	Musselshell River	Musselshell River
Principal Ground-water Aquifer	Kootenai Formation	Kootenai Formation	Judith River Formation	Judith River Formation	Judith River Formation	Kootenai Formation
Nearby Saline Seep	No	No	Yes	Yes	Yes	No
Residential Structures Within 2,000 Feet	None	None	None	None	None	None
Dominant Land Use	Rangeland	Rangeland	Rangeland	Dry-farmed cropland/ rangeland	Rangeland	Rangeland/ dry-farmed cropland
Archaeological Sensitivity	Moderate	Moderate	Low	Low	Low	Low
Paleontological Sensitivity	Moderate	Moderate	Moderate	Moderate	Moderate	Low
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Low	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	O-6	O-7	O-8	O-9	O-10	O-11
Surface Area (acres)	2.312	2.009	2.596	3.013	2.107	1.997
Distance to Malmstrom AFB (mi)	157.4	144.2	120.3	126.7	132.9	138.5
Length of Access Road (ft)	910	235	1,050	710	1,330	3,970
Vegetation	Grassland	Grassland/nonirrigated agriculture	Grassland	Grassland	Grassland	Grassland
Wildlife	Pronghorn	Pronghorn	Pronghorn White-tailed deer mule deer	White-tailed deer mule deer pronghorn	Mule deer White-tailed deer pronghorn	Mule deer White-tailed deer pronghorn
Proximity of Aquatic Habitats (ft)	<500	<500	Adjacent	Adjacent	<500	<500
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	Yes	Yes	No	Yes	Yes	No
Sheet Erosion K-Factor	0.43	0.17	0.17	N/A	0.37	N/A
Wind Erodibility Group	4	8	6	6	4	4
Slope (%)	10-20	5-10	5-10	5-10	10-20	5-10
River Basin	Musselshell River	Musselshell River	Musselshell River	Musselshell River	Musselshell River	Musselshell River
Principal Ground-water Aquifer	Kootenai Formation	Eagle/Virgelle Formation	Eagle/Virgelle Formation	Eagle/Virgelle Formation	Judith River Formation	Judith River Formation
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	1	None	None	None	None
Dominant Land Use	Rangeland	Rangeland/ dry-farmed cropland	Dry-farmed cropland/ rangeland	Rangeland	Rangeland	Rangeland
Archaeological Sensitivity	Low	Moderate	Low	Low	Moderate	Low
Paleontological Sensitivity	Low	Moderate	Moderate	Moderate	Moderate	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Low	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	P-1	P-2	P-3	P-4	P-5	P-6
Surface Area (acres)	2.009	2.009	2.009	2.009	2.009	2.009
Distance to Malmstrom AFB (mi)	84.2	78.9	72.6	69.4	81.5	81.7
Length of Access Road (ft)	687	655	698	1,051	694	593
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture/ irrigated agriculture	Irrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture
Wildlife	Mule deer	Mule deer	Mule deer	Mule deer	Mule deer	Mule deer
Proximity of Aquatic Habitat (ft)	None	500-1,000	500-1,000	None	None	None
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	Yes	Yes	Yes	Yes	Yes	No
Sheet Erosion K-Factor	0.37	0.2	0.37	0.37	0.37	0.37
Wind Erodibility Group	3	4L	6	4L	6	6
Slope (%)	0-2	5-10	2-5	0-2	2-5	2-5
River Basin	Marias River	Marias River	Marias River	Marias River	Marias River	Marias River
Principal Ground-water Aquifer	Kootenai Formation	Glacial deposits	Glacial deposits	Kootenai Formation	Glacial deposits	Glacial deposits
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	None	1
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland/ rangeland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland
Archaeological Sensitivity	Moderate	High	Moderate	Moderate	Moderate	Moderate
Paleontological Sensitivity	Low	Low	Low	Low	Low	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Low

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	P-7	P-8	P-9	P-10	Q-11	Q-12
Surface Area (acres)	2.009	2.009	2.009	2.009	2.169	2.009
Distance to Malmstrom AFB (mi)	74.0	84.2	77.2	92.9	92.1	93.8
Length of Access Road (ft)	800	700	700	569	682	570
Vegetation	Nonirrigated agriculture/grassland	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture
Wildlife	Mule deer	White-tailed deer mule deer	White-tailed deer mule deer	Mule deer	Mule deer	Mule deer
Proximity of Aquatic Habitats (ft)	<500	None	500-1,000	None	None	None
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	Yes	No	Yes	Yes	Yes	No
Sheet Erosion K-Factor	0.43	0.43	0.43	0.43	0.43	0.43
Wind Erodibility Group	4L	4L	5	6	4L	6
Slope (%)	10-20	2-5	2-5	0-2	2-5	2-5
River Basin	Marias River	Marias River	Marias River	Marias River	Marias River	Marias River
Principal Ground-water Aquifer	Glacial deposits	Glacial deposits	Glacial deposits	Kootenai Formation	Glacial deposits	Glacial deposits
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	1	None	None	None
Dominant Land Use	Dry-farmed cropland/ rangeland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland
Archaeological Sensitivity	High	Moderate	Moderate	Low	Moderate	Low
Paleontological Sensitivity	Low	Low	Low	Low	Low	Low
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	Q-13	Q-14	Q-15	Q-16	Q-17	Q-18
Surface Area (acres)	2.009	2.009	2.009	2.089	2.009	2.009
Distance to Malmstrom AFB (mi)	86.3	75.7	75.5	79.4	99.8	93.7
Length of Access Road (ft)	578	690	578	693	573	1,153
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture
Wildlife	Mule deer	Mule deer	Mule deer	Mule deer	Mule deer	Mule deer
Proximity of Aquatic Habitats (ft)	None	None	None	None	None	None
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	No	Yes	Yes	No	No
Sheet Erosion K-Factor	0.43	0.37	0.37	0.37	0.37	0.37
Wind Erodibility Group	5	6	7	6	6	6
Slope (%)	0-2	2-5	0-2	2-5	0-2	2-5
River Basin	Marias River	Marias River	Marias River	Marias River	Marias River	Marias River
Principal Ground-water Aquifer	Glacial deposits	Glacial deposits	Glacial deposits	Glacial deposits	Glacial deposits	Glacial deposits
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	1	1	None	1
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland
Archaeological Sensitivity	Low	Low	Moderate	Low	Low	High
Paleontological Sensitivity	Low	Low	Low	Low	Low	Low
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	Q-19	**Q-20**	**R-21**	**R-22**	**R-23**	**R-24**
Surface Area (acres)	2.009	2.129	2.009	2.169	2.009	2.009
Distance to Malmstrom AFB (mi)	89.6	98.4	85.7	72.4	78.7	75.5
Length of Access Road (ft)	795	620	708	620	574	650
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture/grassland	Nonirrigated agriculture	Nonirrigated agriculture
Wildlife	Mule deer	Mule deer	Mule deer	Mule deer	Mule deer	Mule deer
Proximity of Aquatic Habitats (ft)	None	None	Adjacent	None	None	<500
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	Yes	Yes	No	Yes	Yes	Yes
Sheet Erosion K-Factor	0.43	0.37	0.37	0.37	0.43	0.37
Wind Erodibility Group	6	6	6	6	4	6
Slope (%)	0-2	0-2	2-5	2-5	2-5	0-2
River Basin	Marias River	Marias River	Marias River	Marias River	Teton River	Teton River
Principal Ground-water Aquifer	Glacial deposits	Glacial deposits	Glacial deposits	Glacial deposits	Kootenai Formation	Kootenai Formation
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	None	None
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Rangeland/ dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland
Archaeological Sensitivity	Moderate	Low	Moderate	Low	Moderate	Low
Paleontological Sensitivity	Low	Low	Moderate	Low	Low	Low
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	R-25	R-26	R-27	R-28	R-29	R-30
Surface Area (acres)	2.009	2.009	2.009	2.009	2.009	2.009
Distance to Malmstrom AFB (mi)	65.9	72.3	66.8	52.5	77.8	79.0
Length of Access Road (ft)	650	650	650	655	680	698
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Irrigated agriculture/ nonirrigated agriculture	Nonirrigated agriculture
Wildlife	Mule deer	Mule deer	Mule deer	Mule deer	Mule deer	Mule deer
Proximity of Aquatic Habitat (ft)	None	None	500-1,000	<500	None	<500
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	Yes	Yes	Yes	Yes	Yes	No
Sheet Erosion K-Factor	0.37	0.37	0.37	0.37	0.43	0.37
Wind Erodibility Group	6	6	6	6	5	4
Slope (%)	0-2	0-2	2-5	0-2	2-5	0-2
River Basin	Teton River	Teton River	Teton River	Teton River	Marias River	Marias River
Principal Ground-water Aquifer	Glacial deposits	Glacial deposits	Kootenai Formation	Glacial deposits	Glacial deposits	Glacial deposits
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	None	None
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland/ irrigated cropland	Dry-farmed cropland/ rangeland
Archaeological Sensitivity	Moderate	Moderate	Low	Low	High	Low
Paleontological Sensitivity	Low	Moderate	Low	Low	Low	Low
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	S-31	**S-32**	**S-33**	**S-34**	**S-35**	**S-36**
Surface Area (acres)	2.009	2.009	2.009	2.009	2.009	2.009
Distance to Malmstrom AFB (mi)	60.7	51.1	58	76.8	79.3	60.9
Length of Access Road (ft)	692	563	650	564	650	693
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture
Wildlife	Mule deer	Mule deer	Mule deer	Mule deer	Mule deer	Mule deer
Proximity of Aquatic Habitats (ft)	Adjacent	None	None	None	500-1,000	None
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	Yes	Yes	Yes	Yes	Yes	No
Sheet Erosion K-Factor	0.37	0.32	0.24	0.37	0.37	0.37
Wind Erodibility Group	4	4	3	6	4L	6
Slope (%)	0-2	0-2	0-2	2-5	0-2	2-5
River Basin	Teton River	Teton River	Teton River	Teton River	Teton River	Teton River
Principal Ground-water Aquifer	Glacial deposits	Glacial deposits	Glacial deposits	Glacial deposits	Kootenai Formation	Glacial deposits
Nearby Saline Seep	No	No	No	No	No	Yes
Residential Structures Within 2,000 Feet	None	None	1	1	None	None
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland
Archaeological Sensitivity	Low	High	Moderate	Low	Moderate	High
Paleontological Sensitivity	Low	Low	Low	Low	Low	Low
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	S-37	S-38	S-39	S-40	T-41	T-42
Surface Area (acres)	2.009	2.009	2.009	2.009	2.009	2.009
Distance to Malmstrom AFB (mi)	70.9	57.6	65.4	64.9	98.9	94.4
Length of Access Road (ft)	555	663	650	700	654	695
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture
Wildlife	Mule deer	Mule deer	Mule deer	Mule deer	White-tailed deer mule deer	White-tailed deer mule deer
Proximity of Aquatic Habitats (ft)	500-1,000	None	500-1,000	None	500-1,000	500-1,000
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	Yes	Yes	Yes	Yes	No	Yes
Sheet Erosion K-Factor	0.37	0.37	0.37	0.37	0.37	0.43
Wind Erodibility Group	6	5	6	6	6	4
Slope (%)	2-5	2-5	0-2	2-5	2-5	2-5
River Basin	Teton River	Marias River	Marias River	Marias River	Two Medicine River	Marias River
Principal Ground-water Aquifer	Glacial deposits	Glacial deposits	Glacial deposits	Glacial deposits	Eagle/Virgelle Formation	Eagle/Virgelle Formation
Nearby Saline Seep	No	No	No	No	No	No
Residential Structures Within 2,000 Feet	None	None	None	None	None	1
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland
Archaeological Sensitivity	Moderate	Low	Moderate	Low	High	Moderate
Paleontological Sensitivity	Low	Low	Low	Low	Moderate	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Moderate	Low

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility					
	T-43	**T-44**	**T-45**	**T-46**	**T-47**	**T-48**
Surface Area (acres)	2.009	2.009	2.009	2.009	2.009	2.755
Distance to Malmstrom AFB (mi)	86.4	76.4	89.6	84.1	81.6	84.1
Length of Access Road (ft)	570	676	721	651	686	573
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Nonirrigated agriculture	Grassland/ nonirrigated agriculture
Wildlife	Mule deer	Mule deer	Mule deer	Mule deer	Mule deer	Mule deer
Proximity of Aquatic Habitats (ft)	None	None	500-1,000	500-1,000	500-1,000	None
Threatened and Endangered Species	None	None	None	None	None	None
Oil or Gas Lease Less Than 0.5 Mile	Yes	No	Yes	No	Yes	Yes
Sheet Erosion K-Factor	0.37	0.37	0.37	0.37	0.37	0.37
Wind Erodibility Group	4	6	6	6	6	4L
Slope (%)	2-5	2-5	2-5	0-2	5-10	5-10
River Basin	Marias River	Marias River	Marias River	Marias River	Marias River	Marias River
Principal Ground-water Aquifer	Glacial deposits	Eagle/Virgelle Formation	Kootenai Formation	Eagle/Virgelle Formation	Eagle/Virgelle Formation	Eagle/Virgelle Formation
Nearby Saline Seep	No	No	Yes	No	No	No
Residential Structures Within 2,000 Feet	None	1	None	None	None	None
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland	Dry-farmed cropland/ rangeland
Archaeological Sensitivity	Moderate	Moderate	High	Low	High	High
Paleontological Sensitivity	Moderate	Moderate	Low	Low	Low	Moderate
Historic Sensitivity	Negligible	Negligible	Negligible	Negligible	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible	Negligible	Negligible	Low	Negligible

Appendix A
Existing Environmental Conditions at Launch Facilities in Montana

	Launch Facility	
	T-49	T-50
Surface Area (acres)	2.009	2.009
Distance to Malmstrom AFB (mi)	97.5	90.8
Length of Access Road (ft)	1,013	573.0
Vegetation	Nonirrigated agriculture	Nonirrigated agriculture
Wildlife	Mule deer	White-tailed deer mule deer
Proximity of Aquatic Habitats (ft)	None	500-1,000
Threatened and Endangered Species	None	None
Oil or Gas Lease Less Than 0.5 Mile	No	No
Sheet Erosion K-Factor	0.37	0.43
Wind Erodibility Group	4L	5
Slope (%)	5-10	2-5
River Basin	Marias River	Two Medicine River
Principal Ground-water Aquifer	Two Medicine Formation	Two Medicine Formation
Nearby Saline Seep	No	No
Residential Structures Within 2,000 Feet	None	None
Dominant Land Use	Dry-farmed cropland	Dry-farmed cropland
Archaeological Sensitivity	High	Moderate
Paleontological Sensitivity	Moderate	Moderate
Historic Sensitivity	Negligible	Negligible
Native American Sensitivity	Negligible	Negligible

APPENDIX B

Appendix B.1
PROGRAMMATIC MEMORANDUM OF AGREEMENT

PROGRAMMATIC MEMORANDUM OF AGREEMENT

AMONG

THE UNITED STATES DEPARTMENT OF DEFENSE

THE ADVISORY COUNCIL ON HISTORIC PRESERVATION

AND THE

NATIONAL CONFERENCE OF STATE HISTORIC PRESERVATION OFFICERS

WHEREAS, the Department of Defense (DoD) has been directed by United States Senate Armed Services Committee Report 97-440 to the Military Construction Authorization Bill for 1983 to demolish World War II (1939-1946) temporary buildings (buildings); and

WHEREAS, these buildings were not constructed to be permanent facilities and were intended to be demolished; and

WHEREAS, DoD has determined that these buildings may meet the criteria of the National Register of Historic Places; and

WHEREAS, DoD has determined that its program of demolition of these buildings (program) may have an effect on their qualities of significance and has requested the comments of the Advisory Council on Historic Preservation (Council) pursuant to Section 106 of the National Historic Preservation Act, as amended, (16 U.S.C. 470f) and its implementing regulations, "Protection of Historic and Cultural Properties" (36 CFR Part 800).

NOW, THEREFORE, DoD, the National Conference of State Historic Preservation Officers (NCSHPO), and the Council agree that the Program will be carried out in accordance with the following stipulations in order to take into account the effect of the undertaking on historic properties.

STIPULATIONS

I. DoD will ensure that the following actions are carried out:

A. In consultation with the Historic American Buildings Survey/Historic American Engineering Record (HABS/HAER) (National Park Service, Washington, DC), DoD will develop documentation that includes:

1. A narrative overview of WW II military construction establishing the overall historical context and construction characteristics of each major type of building and including:

a. Explanation of the origins and derivations of the construction techniques and designs.

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b. Chronology that summarizes the political and military decisions that affected scheduling, locations, quantity, design, and construction techniques. Photocopies shall be made of all military manuals used to guide significant aspects of design or construction.

c. Summary statements of major installations' WW II development including site plans, lists of buildings, photocopies of appropriate photographs, and evaluations of the significance of the various building types and groups.

2. Documentation of one example of all major building types that includes: drawings (title sheet, floor plans, sections, elevations, and isometrics of framing systems and other pertinent construction details), photographs (perspective corrected, large format negative and contact print), and appropriate explanatory data. All documentation shall meet HABS/HAER Standards for format and archival stability.

3. Submission of the above documentation to HABS/HAER, for deposit in the Library of Congress, not later than three years from the date of this agreement.

4. Development of the above documentation will be undertaken with periodic reviews by HABS/HAER to ensure that completed documentation will meet HABS/HAER Standards.

B. In consultation with the Council and the NCSHPO, DoD will select some examples of building types or groups to treat in accordance with historic preservation plans (HPP), until such time as demolished or removed from DoD control. The HPPs will be submitted to the Council and the NCSHPO within three years from the date of this agreement. Work done in accordance with the HPPs will require no further review by a SHPO or the Council.

C. All buildings that are identified within sixty days of the Federal Register publication of this Agreement by organizations and individuals will be considered by DoD in its selection of examples to be documented and/or treated in accordance with Stipulations A and B above.

D. Until the documentation program is completed and HPPs have been developed for the representative sample of building types and groups, DoD will continue its current program of building demolition with caution, avoiding disposal of obviously unique and well-preserved, original buildings that are not documented.

II. NCSHPO agrees to:

A. Assist the appropriate SHPO in informing DoD within sixty days of the Federal Register publication of this agreement of buildings that they wish to have considered in the selection of examples to be documented and/or treated in accordance with Stipulations I.A and I.B.

OK 6/61

B. Represent all SHPOs in the consultation on a selection of examples · buildings to be treated in accordance with Stipulation I.B.

III. If any of the signatories to this Agreement determines that the terms · the Agreement cannot be met or believes that a change is necessary, the signatory will immediately request an amendment or addendum to the Agreement Such an amendment or addendum will be executed in the same manner as the original Agreement.

EXECUTION of this Agreement evidences that DoD has afforded the Council a reasonable opportunity to comment on its program of disposal of temporary W· II buildings and that DoD has taken into account the effects of this program on historic resources.

7/2/86

Acting Executive Director, Advisory Council on Historic Preservation

7/7/86

Chairman
Advisory Council on Historic Preservation

6/6/86

President CHARLES E. LEE
National Conference of State Historic Preservation Officers

Historic American Buildings Survey/
Historic American Engineering Record

Department of Defense

Department of Army

Department of Navy

U. S. Marine Corps

Department of Air Force

B. Represent all SHPOs in the consultation on a selection of examples of buildings to be treated in accordance with Stipulation I.B.

III. If any of the signatories to this Agreement determines that the terms of the Agreement cannot be met or believes that a change is necessary, the signatory will immediately request an amendment or addendum to the Agreement. Such an amendment or addendum will be executed in the same manner as the original Agreement.

EXECUTION of this Agreement evidences that DoD has afforded the Council a reasonable opportunity to comment on its program of disposal of temporary WW II buildings and that DoD has taken into account the effects of this program on historic resources.

John M Fowler 7/2/86
Executive Director, Advisory Council on Historic Preservation

7/7/86
Chairman
Advisory Council on Historic Preservation

Charles E. Lee 6/6/86
President CHARLES E. LEE
National Conference of State Historic Preservation Officers

5.13.86
Historic American Buildings Survey/
Historic American Engineering Record

Department of Defense

Paul W. Johnson
Department of Army

Department of Navy

U. S. Marine Corps

Department of Air Force

B. Represent all SHPOs in the consultation on a selection of examples c buildings to be treated in accordance with Stipulation I.B.

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7/2/86
Executive Director, Advisory Council on Historic Preservation

7/7/86
Chairman
Advisory Council on Historic Preservation

6/6/86
President CHARLES E. LEE
National Conference of State Historic Preservation Officers

5.17.86
Historic American Buildings Survey/
Historic American Engineering Record

Department of Defense

Department of Army

F. S. STERNS
Department of Navy

U. S. Marine Corps

Department of Air Force

B. Represent all SHPOs in the consultation on a selection of examples of buildings to be treated in accordance with Stipulation I.B.

III. If any of the signatories to this Agreement determines that the terms of the Agreement cannot be met or believes that a change is necessary, the signatory will immediately request an amendment or addendum to the Agreement. Such an amendment or addendum will be executed in the same manner as the original Agreement.

EXECUTION of this Agreement evidences that DoD has afforded the Council a reasonable opportunity to comment on its program of disposal of temporary WW II buildings and that DoD has taken into account the effects of this program on historic resources.

7/2/86
Executive Director, Advisory Council on Historic Preservation

7/7/86
Chairman
Advisory Council on Historic Preservation

6/1/86
President CHARLES E. LEE
National Conference of State Historic Preservation Officers

6.13.86
Historic American Buildings Survey/
Historic American Engineering Record

Department of Defense

Department of Army

Department of Navy

U. S. Marine Corps

Department of Air Force

E. Represent all SHPOs in the consultation on a selection of examples of buildings to be treated in accordance with Stipulation I.b.

III. If any of the signatories to this Agreement determines that the terms of the Agreement cannot be met or believes that a change is necessary, the signatory will immediately request an amendment or addendum to the Agreement. Such an amendment or addendum will be executed in the same manner as the original Agreement.

EXECUTION of this Agreement evidences that DoD has afforded the Council a reasonable opportunity to comment on its program of disposal of temporary WW II buildings and that DoD has taken into account the effects of this program on historic resources.

7/2/86
Executive Director, Advisory Council on Historic Preservation

7/7/86
Chairman
Advisory Council on Historic Preservation

6/6/86
President CHARLES E. LEE
National Conference of State Historic Preservation Officers

5 13 86
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Department of Defense

Department of Army

Department of Navy

U. S. Marine Corps

Department of Air Force

Appendix B.2
PROGRAMMATIC AGREEMENT

PROGRAMMATIC AGREEMENT
(Under State Historic Preservation Officer
and Advisory Council on Historic Preservation Review)

WHEREAS, the U.S. Air Force, Department of Defense, proposes to deploy the Small Intercontinental Ballistic Missile (SICBM) (undertaking) within the State of Montana; and,

WHEREAS, the SICBM System will be deployed on public land, and the Air Force has management responsibilities with regard to historic properties and Native American traditional, sacred, or ceremonial use areas pursuant to the National Historic Preservation Act of 1966 (16 U.S.C. Sec. 470f, as amended), and its implementing regulations, "Protection of Historic Properties" (36 CFR Part 800), American Indian Religious Freedom Act of 1978, and Archaeological Resources Protection Act of 1979; and,

WHEREAS, the Air Force, in consultation with the State Historic Preservation Officer (SHPO), has determined that the proposed undertaking could have effects upon historic properties included in or eligible for inclusion in the National Register of Historic Places (Register); and,

WHEREAS, pursuant to Section 106 of the National Historic Preservation Act of 1966 and Section 800.13 of the regulations of the Advisory Council on Historic Preservation (Council), "Protection of Historic Properties" (36 CFR Part 800), the Air Force has requested the comments of the Council; and,

WHEREAS, pursuant to 36 CFR 800.13(b) of the Council's regulations, the Air Force has requested development of a Programmatic Agreement (Agreement); and,

WHEREAS, the Air Force, the Council, and the SHPO have consulted and will continue to consult and review the undertaking to consider feasible and prudent alterations to avoid, minimize, or satisfactorily mitigate adverse effects,

NOW, THEREFORE, it is mutually agreed that implementation of the undertaking in accordance with the following stipulations will avoid or satisfactorily mitigate its adverse effects on historic and cultural properties and Native American traditional, sacred, or ceremonial use areas.

Stipulations

The Air Force will ensure that the following measures are carried out.

I. General

A. The Air Force will afford the SHPO and Council an opportunity to review and comment on all scopes of work relating to historic preservation, and the opportunity to review and comment on the historic preservation reports or products generated under this Agreement. Informational copies of these documents will be provided to the Council.

B. The Air Force will provide data and reports generated under this Agreement to the SHPO.

C. The Air Force, in consultation with the SHPO, will notify the public of intended significant actions under this Agreement, will provide timely notice to news media, and will afford the public the opportunity to comment to the Air Force, the SHPO, or the Council regarding these actions.

D. The Air Force, in consultation with the SHPO, will ensure that all historic preservation activities are carried out by or under the supervision of, qualified persons as prescribed in 36 CFR Part 61, Appendix A.

E. The Air Force will take reasonable steps to ensure that stipulations of this Agreement are met by its contractors.

F. The Air Force, in consultation with the SHPO, will ensure that its contractors and Air Force Personnel and resident dependents are advised against illegal collection of historic and prehistoric materials and will encourage those with interests in such materials to participate in nondestructive activities.

II. Identification and Evaluation

A. The Air Force, after consultation with the SHPO, will have a qualified archaeological consultant sample survey of 10 percent of the transporter and erector (T/E) roads. The purpose of this survey is to test a predictive model of prehistoric site distribution and conduct reconnaissance for affected sites. The model and test results will be considered as part of the narrowing process for selection of final deployment sites.

B. The Air Force will notify Native American tribal groups who lived on or used the study area for traditional, sacred, or ceremonial purposes of the proposed undertaking and invite their comments or expressions of concern. Meetings will be arranged if necessary.

C. The Air Force, after consultation with the SHPO, will arrange for surveys of all areas to be disturbed by project-related construction and mitigation of effects. These will include, but are not limited to:

- Launch facility expansions and associated access roads.
- Areas affected by road and bridge upgrading.
- Proposed base housing expansion areas.
- Portions of Malmstrom AFB affected by the SICBM project.
- Hard Mobile Launcher (HML) training area.

D. The Air Force, in consultation with the SHPO, will identify and evaluate for potential National Register eligibility prehistoric and historic properties likely to be affected by the proposed undertaking. This may include:

- Archaeological sites.
- Architectural structures.

- Historic bridges in affected road segments.

- World War II buildings on Malmstrom AFB which may be utilized by SICBM activities.

The Air Force will prepare a mitigation plan for eligible sites after a determination of adverse effect is made. Paleontological materials will be reviewed and evaluated on a case-by-case basis with the SHPO.

III. Mitigation for Adverse Effects

A. Appropriate mitigation (treatment) measures determined after consultation with the SHPO, may include but are not limited to recordation of historic properties to Historic American Building Survey (HABS) or Historic American Engineering Records (HAER) standards; avoidance; excavation and data recovery; fencing; and flagging.

B. In consultation with the SHPO, the Air Force will develop a Cultural Resource Management Plan for documentation or data recovery from historic properties that will be adversely affected or protected. The guidelines will take into account:

1. The data generated by the preliminary and intensive studies.

2. The concerns of local communities and social and ethnic groups.

3. The Native American Religious Freedom Act.

4. 36 CFR Part 61 and its appendices published by the Department of the Interior on July 1, 1986.

5. The standards of the Society of Professional Archaeologists.

6. Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation, 1983.

7. Council Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review, 1985, Draft.

8. Preservation Planning in Context, ACHP.

9. Other applicable Federal regulations, standards, and guidelines.

C. The Air Force will in a timely manner deliver two copies of the study plans and guidelines to the SHPO and Council for their review. The SHPO and Council will provide written notice of receipt and indicate their objections, if any, within 15 working days. Should the SHPO or Council object, the Air Force will arrange a meeting to resolve differences before proceeding with the action to which the SHPO or Council has objected. If the differences cannot be resolved, the Air Force will take the comments into account in deciding whether to and how to proceed.

D. Should an objection be raised by the SHPO, any concerned local communities, or social or ethnic groups, the Air Force will consult with the objecting party to resolve the dispute. If no agreement can be reached, the Air Force will request the comments of the Council pursuant to 36 CFR Section 800.6.

E. During implementation of any portion of the undertaking, should previously unknown historic or cultural problems be discovered, the Air Force will comply with 36 CFR Section 800.11 or the Archaeological and Historic Preservation Act, 16 U.S.C. 469(a)-(c), as appropriate.

IV. Avoiding Inadvertent Damage During Pre-Construction Studies

A. The Air Force will ensure that proper coordination occurs between its personnel and contractors to minimize the danger posed to historic properties by testing, survey teams, and other activities and personnel. Surveys will be conducted in advance of any land-modifying activity, unless the SHPO identifies local conditions which do not warrant additional survey.

B. If test excavations are necessary to obtain data needed for the evaluation of historic properties, the excavations will not be allowed to exceed the scope necessary for basic evaluation, will not utilize mechanized equipment without the approval of the SHPO, and will be carried out in accordance with strict archaeological controls.

V. Monitoring

In consultation with the SHPO, the Air Force will develop a plan for site-specific mitigation of effects and procedures for monitoring during construction.

The Air Force will provide for construction monitors and Native American monitors also if determined necessary through consultation with affected Native American tribes, as appropriate, during ground disturbing activities including but not limited to archaeological testing, enlargement of launch facilities, road widening, and construction. Professional archaeologists qualified to the standards of 36 CFR 61, Appendix A will monitor ground disturbing activities during construction. These activities may include trenching, use of mechanical equipment, road widening, and construction.

VI Definitions

As used in this Agreement:

A. Air Force means the AFRCE-BMS acting by itself or through agents or contractors.

B. Historic and Cultural Properties means properties included in or likely to meet the criteria for inclusion in the National Register of Historic Places.

C. Historic preservation includes, but is not limited to, the identification, evaluation, protection, rehabilitation, reuse, recording of, and salvage of historic properties.

D. Paleontological materials include physical remains or traces of an animal or plant of a former geological age.

E. Potential Impact Area means the area in which the undertaking may reasonably be thought to have potential positive or adverse, direct or indirect effects upon historic properties.

(date)

Executive Director
Advisory Council on Historic Preservation

(date)

PETER WALSH, Lt Col, USAF
AFRCE-BMS/DEV
Norton AFB CA

(date)

Montana State Historic Preservation Officer

(date)

Chairman
Advisory Council on Historic Preservation

(date)

341st Strategic Missile Wing
Malmstrom Air Force Base

APPENDIX C

Appendix C
RESULTS OF CONSULTATION WITH THE U.S. FISH AND WILDLIFE SERVICE IN ACCORDANCE WITH THE ENDANGERED SPECIES ACT OF 1973

Section 7 of the Endangered Species Act of 1973 requires the evaluation of potential project impacts on threatened and endangered species. Five species were identified by the U.S. Fish and Wildlife Service (USFWS) as potentially occurring in the project area. A biological assessment of potential impacts to these species, the bald eagle, American peregrine falcon, grizzly bear, gray wolf (Northern Rocky Mountain wolf), and the black-footed ferret, was sent to the USFWS for their review. This biological assessment concluded that there would be no threat to the continued existence of threatened and endangered species. The response of the USFWS, which agrees with the finding of no effect, is presented in the following.

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Endangered Species, Field Office
Federal Bldg., U.S. Courthouse
301 South Park
P.O. Box 10023
Helena, Montana 59626

IN REPLY REFER TO:

M.37 Small ICBM Missile

May 22, 1987

Peter Walsh, Lt. Col., USAF
Director, Environmental Planning Division
Department of the Air Force
Regional Civil Engineer
Ballistic Missile Support (AFESC)
Norton Air Force Base, California 92409

Dear Colonel Walsh:

We have reviewed the biological assessment and your determination of "no effect" on listed species for the Small Intercontinental Ballistic Missile System at Malmstrom Air Force Base near Great Falls, Montana.

We have discussed the assessment and your determination of "no effect" with Mr. John Gill of your staff. We needed to discuss and add some protective measures for endangered raptors and grizzly bears before we could concur with your "no effect" decision.

We asked Mr. Gill whether the Air Force would adopt the specified management guidelines for the grizzly bear as published in the "Interagency Rocky Mountain Front Management Guidelines for Selected Species" if construction activities occur in occupied grizzly habitat along the Rocky Mountain Front. We also requested Air Force concurrence on a 1 mile nest inventory area for endangered bald eagles and peregrine falcons around any construction in previously undisturbed rights-of-way proposed by this program. Mr. Gill assured us that these additional grizzly bear, bald eagle and peregrine falcon standards and guidelines were acceptable to the Air Force and would become conditions of the program.

Therefore, based upon the information and commitments you provided in your assessment and the Air Force's commitment to the additional above described standards and guidelines, we concur with your "no effect" determination for the grizzly bear, gray wolf, black-footed ferret, bald eagle and peregrine falcon.

During our review we noticed that the Air Force made no commitments to carry out programs for the conservation of listed species as per Section 7(a)(1) of the Endangered Species Act. To assist you in using your authorities to conserve listed species, we provide the following recommendations for your participation in projects that will further the conservation of endangered bald eagles and peregrine falcons.

First, since the peregrine falcon has long been an Air Force symbol, the Air Force could commit to provide logistical support, equipment or funds to establish and maintain a peregrine falcon hacksite within or adjacent to the

proposed project. This program involves erecting artificial structures in which captive-reared peregrine falcons are released into the wild to enhance the re-establishment of wild breeding pairs in areas historically occupied by these endangered raptors. A peregrine falcon hacksite is being planned north of Helena, in Gates of the Mountains Wilderness Area, and within the scope of the proposed Small ICBM Program. Future plans call for hacksites for peregrine falcons along the Rocky Mountain Front, also within view of numerous Air Force launch facilities.

A second program, which would assist the recovery of bald eagles, involves financial assistance to develop specific management plans for bald eagle territories in the project area. There is a need for funds to delineate bald eagle territories and describe breeding pair behavior so management plans can be specifically designed for these eagles. This will allow maximum protection for each pair and the particular habitats they use. These plans will establish minimum areas that should be protected for each pair. There are four known bald eagle eyries within the scope of the proposed Small ICBM Project that need management plans.

We hope you will seriously consider participating in these programs or another conservation program for listed species in Montana. Thank you for your efforts to conserve threatened and endangered species. If you have questions about the additional guidelines we agreed to incorporate into this project, or if you wish to discuss and participate in the conservation measures we suggested, please contact us again.

Sincerely,

Ron Crete

Ron Crete
Acting Field Supervisor
Endangered Species

cc: ES, FWS, Billings, MT

RAC/lal/clh

"Take Pride in America"